THE PROCEEDINGS

OF THE

ROYAL ENTOMOLOGICAL SOCIETY OF LONDON

VOL. X. 1935.

Wednesday, February 6th, 1935.

Dr. S. A. NEAVE, O.B.E., President, in the Chair.

Vice-Presidents.

The PRESIDENT announced that he had nominated Mr. C. L. COLLENETTE, Dr. H. ELTRINGHAM, F.R.S., and Dr. A. D. IMMS, F.R.S., as Vice-Presidents for the year.

Elections.

The following were elected Fellows of the Society:—JOHN CHRISTOPHER BEADNELL CRASKE, 57, Cornwall Gardens, S.W. 7; JOHN HUGH GRAHAM GRIEVE, B.Sc., Public Health Service (Entomologist), Durban, South Africa; LEONARD PARMENTER, 94, Fairlands Avenue, Thornton Heath, Surrey.

Obituary.

The PRESIDENT announced the death of Dr. F. A. DIXEY, F.R.S., elected in 1887, a former President of the Society. A vote of condolence with the relatives of Dr. Dixey was passed on the proposal of the President.

The death of Mr. W. G. CLUTTEN, elected a Fellow of the Society in 1922, was also recorded.

The SECRETARY made the following announcement:—

The Council of the British Association has recently made arrangements with the Ministry of Health by means of which the Association is informed of schemes in progress for town and country planning.

The Association is anxious that it should receive information regarding any site of scientific interest which it is desirable should be included in a town or country planning scheme, or for which valid reasons could be advanced for its being scheduled as a nature sanctuary.

Fellows of the Society are therefore invited to inform the Secretary of any districts which they consider should be included under either of the above headings.

Exhibits.

The following communications were made to the meeting :—

Dr. S. A. Neave, O.B.E., President, exhibited some British insects collected, and, in some cases, bred by Herbert Spencer as a boy. These had been presented to the Society for preservation by the Trustees of Herbert Spencer.

Three Documents relating to the early history of the Society. By Professor Hale Carpenter.

Among some papers in the Hope Department of the Oxford Museum, formerly under the charge of J. O. Westwood, who played such a large part in the early days of the Society, I found one which the Registrar assured me does not exist in the archives.

The Centenary History of the Society contains an extract from the minute book which records that "at a meeting of gentlemen, friends of the science of Entomology, held at the British Museum, May 3rd, 1833," it was "Resolved, that a Society be established for the promotion of the science of Entomology in its various branches, to be called the Entomological Society of London." A committee was appointed with G. R. Gray as secretary.

The document now in question is dated May 13th, 1833, from 22, East Street, Red Lion Square, signed by George Robert Gray, and addressed to "W. Burchell Esq[re] Fulham." It runs as follows: "Sir, I am requested to forward you the accompanying Copy of Resolutions agreed upon at a preliminary Meeting held for the purpose of establishing an Entomological Society and also to express a hope that you will, on or before Wednesday May 22nd, which is fixed for the first General Meeting, authorize me to add your name as an Original Member."

Appended to the letter is a copy of the Resolutions dealing with the establishment and name of the Society, appointment of a Committee of seven (the names are those on p. 7 of the History), holding of periodical meetings, formation of collections and library, publication of communications, enrolment of Original Members and subsequent election of others by ballot; and fixing the annual subscription at one guinea, the admission fee for Original Members at one guinea and for Elected Members at Two Guineas. The first general meeting on May 22nd took place at the "Thatched House," St. James's Street.

It does not appear that Burchell became a member, for his name does not occur in subsequent lists of members.

The second document is not mentioned in the Centenary History. It is headed simply "Entomological Society of London," and has no date, but the year 1833 is pencilled on it. It is a letter signed by "G. R. Gray, Secretary," and runs as follows: "Sir, It having been ascertained that through a purely accidental omission, several Entomologists did not receive a Copy of the Circular inviting their attendance at a meeting to be held at the Thatched House, St. James's Street, on the 22nd day of May last, I beg to inform you that the second general meeting of the Entomological Society will be held at the Society's Room, 17, Old Bond Street, on Monday the 4th of November at 8 p.m. precisely, at which your company and that of any of your friends who may be attached to Entomology is solicited. By order of the Council."

The third document is a prospectus of the Society, not dated, but probably a result of the November meeting and before the commencement of 1834. It gives the Council and officers as stated on p. 9 of the History, with the additional name of W. B. Spence as Foreign Secretary (p. 10). It stated that the number of British and Foreign Ordinary members shall be unlimited, Foreign Honorary members not to exceed ten. The Council shall consist of thirteen members, four of whom shall not be eligible for the following year. The officers shall consist of a President; three Vice-Presidents; a Treasurer, who may be a Vice-President; a Secretary; a Foreign Secretary, and a Curator. On the back of the sheet is a list of eighty-five ordinary members, of whom Charles Darwin is one, one Honorary member (W. Spence, F.L.S.) and the seven Honorary Foreign members named on pp. 9–10 of the History.

The food-plant of the African Nymphaline butterfly *Cymothoe coenis* Drury. By Prof. Edward B. Poulton.

My friend Dr. C. B. Williams has kindly informed me that Mons. Glesquière, in the Belgian Congo, has found the food-plant of *C. coenis* to be *Caloncoba welwitschii* although it occurs accidentally at times on *Piptadenia africana* (Leguminosae). *Caloncoba* belongs to the Flacourtiaceae, allied to the Violaceae and the Passifloraceae. The food-plants of this abundant species are of special importance for the study of its strongly marked migrations, and I therefore applied to my friends of the Kew Herbarium who have supplied the following notes:—

"*Caloncoba welwitschii* (Oliv.) Gilg. is described by Dr. Welwitsch as an elegant bush with erect branches. *Piptadenia africana* Hook. f. ex Benth. is described by Dr. Welwitsch as 'a tree 20–30 ft. high, patently and sparingly branched,' whilst Irvine, in his 'Plants of the Gold Coast,' describes it as 'a tall tree, very striking with its flat tiers of branches,' and states that it is in flower throughout most of the year."

It will be remembered that Miss Vinall * found the larvae at Bongandanga, Basankusu, Belgian Congo, on the leaves of "Bosaaki," which she described as "more of a shrub than a tree." The leaves were considered by the authorities at Kew probably to belong to a species of *Thespesia* (Malvaceae). Mons. Glesquière states that the commonest form of *C. coenis* in the Eala district is *conformis* Auriv., also recorded as "very plentiful here at times," by Miss Vinall.†

Inquiline larvae, probably Lepidopterous, in Termitaria; methods of a Termite-raiding ant, probably *Megaponera foetens* F.: Nyasaland. By Dr. W. A. Lamborn, O.B.E.

[Communicated by Prof. E. B. Poulton, who said that his friend's notes, together with the following, were dated 10 Jan. 1935, and had been sent by air-mail from Fort Johnston.]

I have lately been interested in an amazing inquiline found in termitaria, which must, I think, be a Lepidopterous larva, that of one of the smaller moths.

* 1930, *Proc. R. ent. Soc. Lond.*, **5**: 93.

† 1928, *Ibid.*, **3**: 88. See also 88–91 for the other forms obtained by Miss Vinall and for those collected in Uganda by Prof. Hale Carpenter and Capt. C. R. S. Pitman.

Some five or six years ago I found a large number crawling about among termites in a rotting stump which I split open. I had no lens with me at the time, and when I returned found that the stump had been removed by natives as fuel. I determined recently to make further investigation, and having examined eight or ten termitaria, have obtained three of the larvae. My first impression was that they must be Coleopterous, and that indeed was the reason why I did not trouble about them for so long, but with a lens I see that they have all the features characteristic of the larvae of Lepidoptera, although they have very anomalous characters in the form of a row of seven small flask-shaped tubercles on each side, a pair to a segment. The larvae are light chestnut in colour, exactly the same tint as the termites, and the tubercles are the same except at the apex which is lighter. The larvae rush about with considerable activity in and out of the holes in the termitarium, and as they move are greeted apparently by the termites which make a convulsive movement with their heads, and when they stop, a termite frequently runs up, and applies its mouth-parts to one or other of the tubercles, as if obtaining a "bonne bouche." I have not been able to see the aperture of any duct at the apex, but there may be small cutaneous glands providing secretion, I suppose. Is not that amazing? I have satisfied myself by examination of the intestinal contents of one of these larvae that happened to be crushed, and by carefully watching others, that they feed on the termite fungus, and so I have some hopes of being able to breed them out, when I will try to write a better account than this which is a very hurried one.

Arising from this work I made an observation of some interest on the habits of a large Ponerine ant in regard to its prey. When the stumps are split open the termites seek cover with the utmost despatch, but the Ponerines, which so frequently make their nests near termitaria, rush after them, sting them one by one, and then just drop them, collecting and carrying off the victims, six or seven in their mouths, when the more fortunate termites have all found cover. One might almost imagine from this that the Ponerines have reasoning power. Farquharson may have made this observation, but if so I have forgotten it.*

Further striking evidence of the distastefulness which accompanies the aposematic display of the African Acridian *Zonocerus elegans* Thun. By Dr. W. A. Lamborn.

[Communicated by Prof. Poulton.]

I have made another little observation as to the real value of warning coloration in the case of an Acridian, *Zonocerus elegans*, an immature form, bright yellow with slate blue and some red about it. My kitten seized one in its mouth, but dropped it instantly, and commenced to salivate. Strings of thick mucus an inch long appeared at the corner of its mouth with much frothy saliva, and the animal retched but did not actually vomit. It kept on rubbing its mouth against a tree in an endeavour to get rid of the cause, and was not its usual self for two or three hours. The Acridian had hopped off, apparently little the worse for its

* The description of the Termite-raiding *Megaponera* in our *Proceedings*, **1915** : v–ix, by Prof. Hale Carpenter, C. O. Farquharson, Dr. S. A. Neave, and Capt. C. H. Stigand; also by Prof. Carpenter in *Ibid.*, **1916** : cxxix, does not mention the method recorded by Dr. Lamborn. Prof. Carpenter's later notes (1929, *Ibid.*, **4** : 79, 80) do, however, contain a careful account of the ant stinging and carrying off bundles of its prey.—E.B.P.

experience. I expect that you will remember these grasshoppers, for they display themselves in enormous numbers in open spaces all over Africa at certain seasons.

Further notes on *Laternaria*. By Dr. J. G. Myers.

[Communicated by Prof. E. B. Poulton, who said that the notes, continuing those recorded in 1934, *Proc. R. ent. Soc. Lond.*, **9** : 83, 84, had been written, 3 Jan. 1935, from the Imperial College of Tropical Agriculture, Trinidad.]

In a paper just received from Señor Oscar Monte, through Mr. Box, there are some three pages on *Laternaria*, and I see that neither he, nor another author whom he quotes, agree with Martius as to the spelling and derivation of the Tupi-Guarani name of the insect. Martius, however, was speaking at first hand, and was, moreover, a most able student of Indian languages, whereas probably both Monte and Sampaio are quoting at second- or third-hand. Herewith are Monte's remarks which I have translated very literally :

Monte, O. 1932, As cigarrinhas sugadoras. *Bol. agric. Zootec. Vet. Minas Geraes*, **9** : 27 pp., 20 figs.
p. 20 [translation].

Distinguished in this family by its strange appearance is the famous and even calumniated Jequitiranaboia, also called Cobra do Ar [air snake] or Cobra de Asa (winged snake) or else Gitiranaboia, which in our Tupi Indian means *yakirana* (cicada) and *mboya* (snake), that is, cicada-snake or cicada with a head like a snake or, as one reads in T. Sampaio, *Yakirana* (something like a louse) or that is, a cicada whose body resembles, to the Indian, a large louse (*Cicada*).

Monte further mentions a reference by Le Cointe (*La Nature*, 1905), which I cannot refer to in Trinidad, describing the song of *Laternaria* and the ceremonial precautions taken by the Amazon Indians to avoid the "*dardo homicida*" with which its thorax is armed.

Notes on a special method of making butterfly pictures. By L. G. O. Woodhouse.

Collectors in foreign countries are often handicapped by the lack of good illustrations of butterflies, obtainable at reasonable cost, by which to identify their collections.

The method of simultaneously transferring the scales from both sides of butterfly wings on to gummed or waxed paper, has been known for many years, and I found it a most useful and handy method for making good and accurate pictures for ready reference, provided the butterfly is not a rare one, and a duplicate can be spared from the collection.

The following is a brief outline of the method I have adopted :—

A piece of good white paper is folded in half and then gummed or waxed; having carefully cut off the fore- and hind-wings from the same side of the butterfly, place them on the gummed or waxed paper; fold it over, and then place it on a very hard, smooth surface—such as a piece of flat glass or china. Each side of the folded paper is then very firmly, but evenly, pressed with a very hard tool—such as a wooden roller. If gum is used the pressure will have to be applied quickly, before the gum has dried. The folded paper is then carefully peeled apart, and

the wings, now wholly or partly denuded of scales, carefully removed. Although surprisingly good results can be achieved, it is evident that the scales have been reversed, with the result that the pictures are very disappointing with such families as the Lycaenids and Papilios.

With the help and advice of my friends, Mr. J. V. Collins, M.A., Sc.M., F.I.C., the Ceylon Government Analyst, and Mr. G. M. R. Henry, of the Colombo Museum, the following method has been evolved :—

The scales are first pressed off on to waxed paper, which is then carefully stuck on to a piece of gummed paper, and left to dry completely, after which both papers, closely adhering to each other, are immersed in a bath of petrol (which dissolves the wax but which does not affect the gum).

I am calling the single process the "Gum" method and the double one the "Wax-cum-Gum" method and have described each in detail below.

Description of the "Gum" Method.

Tools required.

Forceps for handling the butterflies and their cut-off wings. A sharp-pointed pair of small scissors for cutting the wings off the bodies. A finger-bowl with which to cover the cut-off wings, in order to prevent their being blown away. A good brand of white paper. Some large pieces of gum arabic, dissolved in water and carefully strained so as to be as thick, but clean and transparent, as possible. A couple of stiff-haired brushes for covering the paper as quickly, evenly and thinly as possible. A hard surface, such as plate glass, on which to press off. Some hard article—a bone tooth-brush handle—with which to press off. A good sharp knife.

The "Gum" Process.

(i) Very carefully cut off one side (fore- and hind-wings) of the butterfly, as close to the body as possible, and place the two wings under a finger-bowl. (ii) Cut off a rectangular piece of the white paper, sufficiently large to cover the *whole* butterfly had it been properly set. (iii) Carefully fold the paper in half and open it out again for gumming. (iv) Correctly gumming the paper is most important and makes or mars the picture. The gum must be applied with a brush as lightly and evenly as possible; if it is uneven, or too thick, the scales will coalesce and the picture will be hopelessly blurred; if there are patches with little or no gum the scales will not adhere to the paper. (v) With the forceps place the wings in position on half the gummed paper, and fold the other gummed half over them. (vi) As firmly and evenly as possible, press on the folded paper with the hard article on the hard surface, turning the folded paper over so that both sides are evenly pressed and the scales come off from both sides of the wings. (vii) Carefully peel the folded paper apart when the now diaphanous wings, both sides of which have been wholly or partly denuded of scales, can be picked off with the forceps. *Note :* The application of the gum to the paper and the subsequent operations (v), (vi) and (vii) should all be done as quickly as possible before the gum has dried. (viii) When the gum is dry, the transfer can be carefully cut out and pasted on to a suitable mount—white or coloured—and correctly spaced so that the body and antennae may be drawn in against the upperside. The name

of the butterfly, locality and date of capture must, of course, be carefully recorded on the mount, which I protect with a piece of tracing paper.

The following are a few remarks on the "Gum" method.

It will be evident that when this process has been completed, the scales in the transfer pictures have been reversed, but this does not seem to matter for some families—Nymphalids, Pierids, Hesperids, etc., in which the scales are presumably the same colour and texture on both sides. In the majority of cases these transfer pictures are more accurate and reliable—both for colour and detail—than ordinary coloured reproductions. But in the case of the Lycaenids and some Papilios, etc., the colours are incorrect. In some species, *e.g.* the Charaxes, reversing the scales brings to light wonderfully delicate sheens of beautiful and varying hues which are certainly not perceptible in the real butterfly wing. In other butterflies—the Danaids, the Pierid—*Pareronia valeria ceylonica*—and certain of the Papilios—*alcibiades*, *nomius*, *doson*, *teredon*, *agamemnon*—some of the coloured scales are replaced by a pigment in the membrane of the wings, so that the colour transfer of that part of the wing is not possible. Two pictures can be made from each complete butterfly; or if one side is damaged, instead of discarding the insect one good picture can be made from the undamaged side. In some cases, *e.g.* yellow Pierids, the chemical action of the gum gradually makes the colours dingy and dull. This might be counteracted by mixing the gum with an equal quantity of a saturated solution of aluminium sulphate. I have found that the best results are obtained from fresh specimens, *i.e.* if the transfer is made within 24 hours of capture; but quite good transfer pictures can be got from old specimens, which, however, must be carefully "relaxed."

To sum up, the "Gum" method at its best, produces pictures which are not only very accurate in outline and detail, but the colours are correct in depth and tone; and at its worst, produces an accurate outline of form and detail. Between 1924 and 1929 I made "Gum" pictures of almost every one of the 233 known Ceylon butterflies, which I found most useful in England in 1929 when I arranged my Collection, which I had sent home ahead to be set and kept for me.

Very striking and beautiful results can be obtained by using waxed, instead of gummed, paper, but the wax transfers are not so easy to mount, and being much more fragile and liable to melt in heat, are more difficult to keep intact.

Description of the "Wax-cum-Gum" Method.

Tools required.

In addition to the items mentioned above, the following are required—

A device for exerting very considerable pressure—I use an old, iron, copying letter-press.

Good waxed paper, which I have had great difficulty in procuring. Various kinds of white and coloured papers—thick and thin. Blotting-paper.

The "Wax-cum-Gum" Process.

(i) Very carefully cut off one side (fore- and hind-wings) of the butterfly, as close to the body as possible, and place the two wings under a finger-bowl. (ii) Cut out a piece of rectangular waxed paper, sufficiently large to cover the whole

butterfly had it been properly set. (iii) Carefully fold piece of paper in half and open it out again. (iv) Place the paper in position on a larger piece of blotting-paper, which will subsequently be folded over. (v) Place the wings carefully in position on half the waxed paper; fold the other waxed half over, and enclose the waxed paper in the blotting-paper. (vi) Then very carefully insert the whole in the iron, letter-copying press and apply as much pressure as is possible. The blotting-pad should then be carefully extracted and the tooth-brush handle or wooden roller used for both sides on the hard surface, and a final pressure by the copying press applied. (vii) Peel the folded waxed paper apart, when the now diaphanous wings, both sides of which have been wholly or partly denuded of scales, can be picked off with the forceps. (viii) Each waxed transfer is then carefully stuck on to a piece of paper, on to which a liberal but even application of dissolved gum arabic has just been made; very little pressure is necessary—just sufficient, with the fingers, to press out any air bubbles; the gum must be allowed plenty of time to dry (I always leave it for 24 hours at least) in between the blotting-paper, which I insert in an old magazine with sufficient weight to keep the gum and waxed paper quite flat. (ix) When convenient, but never less than 24 hours after stage (viii), the waxed paper can be separated from the gummed paper by immersion in a bath of petrol, which dissolves the wax but does not affect the gum. (x) Before putting the gummed paper to dry, immerse it in a fresh petrol bath in order to wash all wax away. (xi) When the petrol has completely evaporated from the gummed paper the transfer may be carefully cut out and pasted on to a suitable mount and correctly spaced so that the body and antennae can be drawn in against the upperside. The name of the butterfly, locality and date of capture must, of course, be carefully recorded on the mount, which I protect with a piece of tracing paper.

The following are a few remarks on the " Wax-cum-Gum " method.

In some of the more brilliant and varying-hued butterflies the wing-scales may be compared to minute reflecting, but uncoloured, lenses or prisms which must be the right way up to reflect and refract the light rays. Consequently, the single " Gum " process is a failure, whereas the double " Wax-cum-Gum " one produces a transfer picture which surpasses any other of which I am aware. By varying the colour or thickness of the paper on which the gum is applied (viii) great improvements can be effected. For instance, if thick dark brown paper is used for the uppersides of *Papilio crino*, and *Lampides bochus*, *Tajuria longinus*, etc., the resultant transfer picture can be very favourably compared with the actual wing. I use grey or brown-tinted, thin paper for *Spindasis*, and before pasting the gummed paper on to the mount, I colour, on the reverse side, the black-tipped wings, which enhances the velvety look. To get the best effect for *Hestia jasonia* I use the best Air-mail white paper and pick out the spots in black, on the reverse side of the gummed paper, before pasting on its mount. Similarly for such Pierids as *Delias eucharis* and its well-known mimic *Prioneris sita*, I use very thin white paper and colour the red marginal spots on the reverse side of the under wing which show through pink just as they appear on the actual wing.

By using very thin paper the difficulty referred to in (ii) above can be overcome by colouring on the reverse side.

In the " Wax-cum-Gum " method the butterflies must be completely dry, or the juices will spoil the wax transfers. I have obtained perfect results from specimens taken 18 years ago, and which the collector was going to throw away; it is of considerable advantage to be able to wait and utilise old specimens from a collection which has been replenished by fresh ones. I see no reason why butterflies captured 50 years ago should not make good pictures provided the insects are well preserved and in good condition.

The pictures take up little room and are available for ready reference. I have found them excellent for lecture purposes and they seem unaffected by the heat of an epidiascope.

I would emphasise that I do not wish to imply that butterfly pictures made in the " Wax-cum-Gum " method can take the place of any well-set, perfect insect. But for amateur lepidopterists, who have to spend most of their working lives in a tropical climate, it is heartbreaking to see beautiful specimens being ruined by mould and mites, and if chemicals are used as a deterrent in store boxes the insects quickly lose their colour and sheen.

I keep the rubbed-off wings, bodies and all the " spare parts " labelled and indexed to my pictures and I venture to think that this somewhat unique collection may be of some practical help to the " cabinet " naturalist, to which I humbly aspire when my official work in Ceylon is done and I retire home to England.

In conclusion, I realise only too well that the " Wax-cum-Gum " process is not by any means perfect and I hope that anyone interested will work in conjunction with me and exchange ideas for our mutual benefit.

Biology of Indian mosquito larvae that attach themselves to roots of water plants.

By M. O. T. Iyengar (a visitor).

Larvae and pupae of several species of mosquitoes do not come to the surface of water to obtain their supply of oxygen; they get it by tapping the air cavities in the roots of aquatic plants. In India, three species of *Mansonioides* (*M. annulifera* Theo., *M. uniformis* Theo. and *M. indiana* Edw.) and one of *Ficalbia* (*F. hybrida* Leic.) have been observed with this habit. The plant utilised by these mosquitoes is *Pistia stratiotes*.

For this interesting method of obtaining oxygen from the roots, the breathing apparatus of the larva and the pupa is modified to pierce the root tissue. In the larva of *Mansonioides*, the siphon is provided with spines at the apex and with a saw-like structure. This is worked by a long chitinous rod which is moved up and down by a set of muscles and by this means the larva is able to pierce the root. After that is done, the hooks at the apex of the siphon are made to protrude, thereby anchoring the larva to the root.

The mechanism in the siphon of *Ficalbia hybrida* is very similar, except that the siphon is less specialised and the saw-like structure is absent. The mechanism of penetration of the root and of anchoring the larva is like that observed in the larva of *Mansonioides*. To release its hold on the root, the larva withdraws the hooks.

The pupae also attack the root for oxygen, and their breathing tubes are adapted for piercing the root tissue. In *Mansonioides*, the apex of the tube is produced into a chitinous, lancet-shaped structure, on either side of which are

flat transparent wing-like flaps which have minute curved hairs; these and a large hook near the tip of the tube serve to fasten the pupa to the root. The breathing tubes of the pupa of *Ficalbia hybrida* are similar though less specialised. In this species the apex of the tube is divided into two parts, one of which is furnished with a chitinised spike in the middle and the other of which is thin and transparent. In both of these are minute curved hairs which serve to retain the respiratory trumpet in its position in the root.

It is interesting to observe how a larva attaches itself to the roots of the water-plant. The larva moves backwards with its siphon pointing horizontally and thrusts the tip of the siphon into the root. Once the siphon comes in contact with the root, the larva wriggles backwards and by working the chitinous rod controlling the hooks, it penetrates the root deep enough for the siphon to enter the air cavity. The pupa, on the other hand, moves forwards in a horizontal plane with its two breathing tubes kept together.

In India, these mosquitoes use only one species of water plant, *Pistia stratiotes*, to obtain their supply of oxygen. Not all water plants are suitable for this purpose. To be suitable a plant must fulfil several conditions: the root or stem should hang in the water; it should be soft enough to be pierced; there should be large longitudinal air cavities close to the periphery. *Pistia stratiotes* seems to fulfil these conditions best, which would explain why these mosquitoes prefer this plant to any other.

Pistia was invariably found in the breeding places of the four Indian species of mosquitoes mentioned above. I carried out some experiments in Travancore to determine whether *Mansonioides* larvae would survive in the absence of *Pistia*. Ponds with *Mansonioides* larvae were cleared of *Pistia* and all the larvae were put back into the pond. Although aquatic plants other than *Pistia* were allowed to remain in the water, it was found that in two days all the larvae of *Mansonioides* had disappeared. The larvae, being sluggish and heavier than water, seem to be ill fitted for free living and unable to protect themselves from their natural enemies.

Mansonioides is dependent on *Pistia* for another reason, since the three species studied in India would lay eggs only on *Pistia* plants. The method of oviposition is interesting as the mosquito thrusts its abdomen into the water and lays eggs on the submerged portions of the leaf of *Pistia*, in a manner described previously (Iyengar, 1933, *Ind. J. med. Res.*, **21** : 101). Mosquitoes enclosed in jars would not lay eggs in the absence of *Pistia*, but as soon as this plant was introduced they laid eggs on its leaves. This indicates that *Pistia* is essential for the oviposition of the eggs of *Mansonioides*.

The presence of *Pistia* is one determining factor for *Mansonioides* breeding; there is, however, another, and that is the presence of organic contamination. In the absence of the latter, a pond with *Pistia* may remain free from *Mansonioides*, but when organic matter is introduced *Mansonioides* may start breeding in the pond. The amount of organic contamination should not be too heavy.

In regard to the four species *M. annulifera*, *M. uniformis*, *M. indiana* and *F. hybrida*, the close association between these mosquitoes and *Pistia* is due to the fact that the larvae are dependent on *Pistia* for their oxygen and are incapable of a free life, at least in their early stages. And yet, another species of *Ficalbia*,

F. minima, was always found to be associated with *Pistia* although the larvae and pupae of this species were free living and independent of *Pistia* for oxygen supply. *F. minima* was not observed to breed apart from *Pistia*, and this is explained by the recent observation made by me that *F. minima* lays its eggs on *Pistia* on the portions of the leaf overhanging the water surface. The eggs of *Ficalbia* were not known previously, and this observation is therefore of much interest. In this case, the close association between *F. minima* and *Pistia* is due to the fact that the mosquito would lay its eggs only on *Pistia*.

Phenological Records. By Maj. H. C. Gunton.

Since I last addressed this Society I have been fortunate enough to secure the assistance of Capt. Dannreuther, the Hon. Sec. of the Insect Immigration Committee of the S.E. Union of Scientific Societies and through him the collaboration of three other observers in S.E. England. It has therefore been possible to prepare new diagrams embodying a greater range of observations and recalculated averages. Particulars have also been plotted separately, and these have been placed at my disposal by an observer in N.W. England.

As a result of the increase in data in the S.E. district, which will be the district referred to unless otherwise stated, inconsistencies have already been much reduced and salient characteristics emphasised to an extent which is very encouraging but which points to the desirability of further co-operation.

Regarding the diagrams it will be convenient to refer to certain considerations which will facilitate the appreciation of their contents.

As regards the choice of a temperature measuring rod, the weekly basis is considered to be the most suitable. The use of the accumulated temperature curve has been dropped, for while it is, to some extent, interesting and instructive, it is inconvenient, if not useless, in connection with many of the changes between earliness and lateness of appearance of the insects with which we have to deal.

I give below an analysis of the diagrams prepared since these are not reproduced here. They are, however, available on application to me and some are being reproduced in a paper to be published by the Royal Meteorological Society shortly. A list of the species referred to will be found at p. 15. The names given for the Rhopalocera are those used in 1934, *Generic Names Brit. Ins. R. ent. Soc. Lond.*, and for the Heterocera those used in South, R., 1907, *Moths of Brit. Isles*.

S.E. 1922. Species 1–10.

Commencing with a state of earliness for Nos. 1–5 due to two warm spells, there followed a long cold period—9 weeks including only 2 weeks just above average, which caused a swing over from 8 days early for No. 5 due at 88th day to 31 days late for No. 6 due at 94th day. The other four insects observed, with due dates within this cold period, were also late by varying amounts up to 22 days.

S.E. 1923. Species 1–10.

A warm period of 11 weeks including only 1 week with slight deficit caused, with the exception of 3 species, marked earliness amounting to 8, 12, 41, 11, 17 and 28 days.

N.W. 1923. Species 1–10.

Generally similar temperature conditions to those in the last case gave corresponding and more consistent results, earliness being 4, 21, 12, 7, 11, 17, 25, 14 and 28 days with No. 10 missing early emergence as in the case of No. 9 and becoming slightly late. It is of interest to note that the due date of this insect was further ahead of the corresponding warm period than in S.E. 1923 when it emerged early. It also responded early in N.W. 1926.

N.W. 1924. Species 1–10.

Following the appearance of No. 1 at average date, the remainder were late by 17, 3, 7, 9, 7, 7, 16, 13 and 26 days as the result of a 13 weeks' cold period relieved by only 2 weeks with excess of 2 degrees.

S.E. 1925. Species 1–10.

Two groups of lateness corresponding to cold spells at due date, each followed by warm spells, the lateness being 14, 8 and 6 days in the first case and 13, 22 and 9 days in the second. This section also provides an example of a sudden change from 9 days early (No. 4) to 14 days late (No. 5) for insects due at days 82 and 88 respectively.

N.W. 1926. Species 1–10.

With one inconsistent exception two groups of earliness, the first of 7, 15, 19, 26 and 45 days and the second of 3, 29 and 35 days, corresponding to two markedly warm spells (4 weeks above 4 degrees excess and 2 weeks above 5 degrees excess respectively).

S.E. 1927. Species 21–41.

This case illustrates a gradual swing over from 14 days early (No. 21) to 12 days late (No. 39) as the result of 9 weeks' cold spell relieved by only 2 weeks with excess of less than 1 degree. The effect of these 2 weeks is, however, apparent in retarding the swing over.

S.E. 1931. Species 12–34.

This case illustrates a gradual swing over from 11 days late (No. 12) to 24 days early (No. 34) as the result of 4 weeks' warm spell with excess temperature throughout.

S.E. 1919. Species 1–42.

A degree of lateness of 19 days (No. 1) following a cold commencement to the year was changed to a slightly forward tendency at No. 3 by a mainly slightly warm period of 4 weeks. Lateness was restored to the immediate extent of 15 days at No. 4, due only two days later, and to varying extents for the following insects by two further cold spells. At the 123rd day a definitely warm spell set in, which, after 3 weeks, produced an early tendency which was neutralised and reversed, with two exceptions, to a marked degree of lateness by a further prolonged cold spell.

S.E. 1927. Species 33–50.

Three cold spells with two intermediate relatively warm spells of slight excess caused variations from 2 days early (No. 33) to 22 days late (No. 42). An example is presented of two species (Nos. 43 and 44) emerging at the end of the first warm

spell after their due dates, while a third species (No. 42) waited through another cold spell to emerge at the beginning of the next warm spell. A later cold spell caused lateness of 34 days (No. 46) while Nos. 47, 48 and 49 were 21, 17 and 12 days late and No. 50 6 days early, all the last four species emerging when the temperature rose to within 1 degree (deficit) of the average after a deficit of nearly 5 degrees for one week followed by a deficit of over 2 degrees for another week.

S.E. 1934. Species 33–50.

In this case two long spells of marked excess temperature, separated by one week of deficit, maintained with two exceptions of slight lateness, degrees of earliness varying from 4 days to 20 days.

S.E. 1932. Complete Diagram 4.

A warm winter and an excess temperature of 8 degrees caused the emergence of No. 1 on the 23rd day—25 days early—but a long spell of mainly cold weather (5 weeks including 1 week of about 1 degree excess) caused plants and insects to become late up to 8–15 days until both were brought back to normal by a warm spell of 2 weeks—No. 6 (*P. rapae*) emerged 20 days early during a cold spell, but it will be seen that during this cold period there was a period of marked sunshine excess. The remainder of the season shows periods of considerable lateness brought back to normal or slight earliness by moderate warm spells until a long spell of warmth between days 220–260 caused the last few insects to be early. Second broods, with one exception, were late varying from 7 to 34 days.

S.E. 1933. Complete Diagram 5.

The diagram for this abnormal year speaks for itself—after a winter of about average temperature there followed a succession of periods of marked warmth including peaks of 5 degrees, 6 degrees and 7 degrees excess with only two short periods of deficit, the average excess temperature throughout the spring and summer being 2·7 degrees and the resulting earliness amounted in many cases to between 20 and 30 days. The earliness of second broods also reached 20–30 days in four cases.

N.W. 1933. Complete Diagram 8.

This diagram is, at the moment, rather difficult to understand. With temperatures throughout the winter, spring and summer practically the same as those for the S.E. district, the degree of earliness is very markedly less. It will be seen from the diagram and from the following table, however, that the rainfall and sunshine in the two districts differ materially, the sunshine in the N.W. being less but the drought more severe. In the absence of more than one set of observations for this district it does not seem possible to do more than bear these figures in mind in other analyses.

Temperature.		Rainfall.		Sunshine.	
Spring.	Summer.	Spring.	Summer.	Spring.	Summer.
S.E. +2·6 deg.	+2·8 deg.	102%	70%	110%	120%
N.W. +2·7 deg.	+2·7 deg.	86%	54%	88%	110%

S.E. 1934. Complete Diagram 6.

A cold winter with marked deficit extending to 98th day, causing lateness of plants and insects up to 15 days late, was followed by a succession of periods of marked warmth separated by single weeks only of deficit and resulting in a swing over through the average dates, both plant and insect, to a marked degree of forwardness for the remainder of the season, only less remarkable than that of 1933 (S.E.). The warm spells contained peaks of 4 degrees to 5 degrees excess and the corresponding earliness of insects showed many cases of the order of 10 to 20 days.

The earliness of second broods reached 20 to 30 days, emergences all taking place during the sustained period of excess temperature between the 180th and 213th days.

Conclusion. It will be seen that there is a large measure of consistency between the temperature fluctuations, using the weekly measuring rod, and the earliness and lateness of the insects. An attempt has been made to express the relationship in some simple form, but a study of the diagrams has led to the conclusion that this is impossible if it is not to be misleading in a large proportion of cases, for the following reasons. Except in instances where the persistence of a certain type of weather causes a gradual growth of forwardness or lateness or a gradual change over from one state to the other, it seems clear that early emergence depends on the occurrence of a warm period within a certain time distance in advance of the normal date for emergence. The same spell must result in different degrees of earliness according to that distance in advance, until a critical point is reached when the end of the warm period fails to induce emergence in the later insects. Late emergence, on the other hand, occurs when the normal date falls within a cold spell and is limited by the arrival of the next spell, sufficiently warm to induce emergence, and as the normal dates get later the ultimate lateness gets less. It has been seen that the response of the insects to sudden fluctuations may be very rapid, resulting in one being appreciably early while another, separated only by a few days in normal date, becomes appreciably late, and it also seems clear that the same influences which effect separation into earliness and lateness between adjacent insects, in the order of normal appearance, must also frequently interrupt the period of emergence of a single insect, and in such cases it is not necessary to regard the isolated or scarce early specimens as freaks.

If, then, we wish to be able to gauge the prospects of emergence in any ordinary, or extraordinary, season containing the fluctuations of temperature which are so usual, it appears that we must disregard to a large extent the average or accumulated temperatures of the season and concentrate on the close observance of the alternating warm and cold spells in relation to the normal dates of emergence which are being approached, bearing in mind the portion of the average weekly temperature curve which has been reached and the characteristics of the different species.

It is considered that the next stage of these investigations must include the adjustment of the lists of species to suit the local requirements of the different districts, the comparison of results obtained from different districts and the differences in the response of individual insects according to their life-histories and to the extent of their protection in the pupa state. To do this effectively there must be an increase in the number of observers.

It has been considered desirable to explain what has been done up to the present in order that assistance may, if possible, be obtained in time for the forthcoming season.

The following are the gentlemen who have kindly placed their own observations at the disposal of the author of these notes.

S.E. Dr. G. V. Bull, Brig.-Gen. B. H. Cooke, C.M.G., C.B.E., D.S.O., W. S. Gilles, F.I.C., F.C.S.; N.W. Dr. R. C. Lowther, M.B., Ch.B.

S.E. ENGLAND PHENOLOGICAL RECORDS, 1919–1934.

Index Sheet.

Species.

			First dates (average).		
1. *H. marginaria*	Dotted Border.	P.	Feb.	17	
1*a*.	Sallow (b).		Mar.	10	
2. *T. stabilis*	Common Quaker.	P.	,,	17	
3. *H. multistrigaria*	Mottled Grey.	P.	,,	21	
3*a*.	Wood Anemone (b).		,,	23	
4. *K. areola*	Early Grey.	P.	,,	23	
5. *A. badiata*	Shoulder Stripe.	P.	,,	29	
5*a*.	Larch (f).		,,	31	
6. *P. rapae*	Small White (B). D or M.	P.	Apr.	4	July 20
6*a*.	Blackthorn (b).		,,	4	
7. *S. bilunaria*	Early Thorn. D.	P.	,,	4	,, 24
7*a*.	Elm (f.)		,,	22	
8. *T. punctularia*	Grey Birch.	P.	,,	30	
9. *K. fluctuata*	Garden Carpet. D.	P.	,,	30	,, 21
10. *L. argiolus*	Holly Blue (B). D.	P.	,,	30	,, 26
10*a*.	Oak (f).		May	3	
10*b*.	Hawthorn (b).		,,	9	
11. *C. ferrugata*	Red Twin-spot Carpet. D.	P.	,,	13	,, 27
12. *D. luteolata*	Brimstone. D.	P.	,,	13	Aug. 10
13. *C. pamphilus*	Small Heath (B). D or M.	L.	,,	19	
14. *S. menthastri*	White Ermine.	P.	,,	20	
14*a*.	White Ox-eye (b).		,,	22	
15. *A. plagiata*	Treble Bar. D.	L.	,,	22	,, 13
16. *X. montanata*	Silver Ground Carpet.		,,	22	
17. *H. lupulinus*	Common Swift.	L.	,,	23	
18. *H. jacobaeae*	Cinnabar.	P.	,,	23	
19. *P. icarus*	Common Blue (B). D or M.	L.	,,	25	July 30
20. *H. dentina*	Shears.	P.	June	1	
21. *S. lubricipeda*	Buff Ermine.	P.	,,	2	
22. *H. trigrammica*	Treble Lines.	L.	,,	3	
22*a*.	Dog Rose (b).		,,	4	
23. *O. violata*	Large Skipper (B).	L.	,,	8	
24. *C. bilineata*	Yellow Shell.	L.	,,	9	
25. *H. strigilis*	Marbled Minor.	L.	,,	12	

			First dates (average).
26.	*K. jurtina*	Meadow Brown (B).	L. June 13
27.	*Z. filipendulae*	Six Spot Burnet.	L. ,, 18
28.	*T. pronuba*	Large Yellow U'wing.	L. ,, 20
29.	*K. monoglypha*	Dark Arches.	P. ,, 22
30.	*P. chrysitis*	Burnished Brass.	L. ,, 22
31.	*M. persicariae*	Dot.	P. July 2
32.	*A. grossulariata*	Magpie.	L. ,, 5
32*a*.		Harebell (b).	,, 5
33.	*B. gemmaria*	Willow Beauty.	L. ,, 6
34.	*L. lithargyria*	Clay.	L. ,, 6
35.	*O. sambucaria*	Swallow-tailed.	L. ,, 8
36.	*L. conigera*	Brown Line Bright Eye.	L?. ,, 8
37.	*B. perla*	Marbled Beauty.	L. ,, 9
38.	*P. similis*	Yellow Tail.	L. ,, 10
39.	*A. urticae*	Small Tortoiseshell (B).	I. ,, 12
40.	*C. trapezina*	Dunbar.	?. ,, 16
41.	*D. limitata*	Shaded Broad Bar.	L. ,, 21
42.	*N. io*	Peacock (B).	I. Aug. 6
42*a*.		Devil's Bit Scabious (b).	,, 6
43.	*D. antiopa*	Common Vapourer.	E. ,, 10
44.	*N. xanthographa*	Square Spot Rustic.	L. ,, 12
45.	*T. populari*	Feathered Gothic.	E?. ,, 28
46.	*K. circellaris*	Brick.	E. Sep. 20
47.	*A. lychnidis*	Beaded Chestnut.	E. ,, 24
47*a*.		Ivy (b).	,, 26
48.	*O. vaccinii*	Chestnut.	I. ,, 28
49.	*M. oxyacanthae*	Green Brindled Crescent.	E?. Oct. 3
50.	*O. dilutata*	November Moth.	E. ,, 14

(B) Butterfly; D, Double Brooded; M, Multi-Brooded.
Winter State :—E, egg; L, larva; P, pupa; I, imago; (b) blossom; (f) foliation.

Wednesday, 6th March, 1935.

Dr. S. A. Neave, O.B.E., President, in the Chair.

Election of Fellows.

The following were elected Fellows of the Society :—George Edward Hyde, 20, Woodhouse Road, Doncaster; Lionel Gilbert Ollyett Woodhouse, The Surveyor General's Office, Colombo, Ceylon.

Obituary.

The death of Mr. J. D. Ward, elected a Fellow of the Society in 1919, was announced.

Papers.

The following papers were read :—

" Location of olfactory receptors in insects—review of experimental evidence," by J. Marshall.

" A contribution to the classification of the Coleopterous family Lucanidae," by G. J. Arrow.

" Supplementary notes on the structural characteristics of *Pyrgus freija* (Warren, 1924) (Lep. Hesperiidae)," by B. C. S. Warren.

Gift to the Society of rare printed works and manuscripts of Jacob Hübner.

The President said that he had great pleasure in announcing that, thanks to the munificence of Mr. R. W. Lloyd, the Society had just acquired a unique collection of the works, both printed and in manuscript, of Jacob Hübner, as well as many original drawings. He asked the Treasurer, who was an acknowledged expert on Hübner's work, to describe some of the more interesting items to the meeting, and proposed a very sincere vote of thanks to Mr. Lloyd for this further evidence of his extraordinary generosity towards the Society, and this was agreed unanimously.

Mr. Hemming then said :—

" The present collection of Hübner's works and manuscripts is of exceptional importance. The Society now possesses a copy of every entomological work published by Hübner except the *Lepidopterologische Zuträge* of 1820, and his catalogue of the Franck collection, copies of which are, however, available for study in the Department of Entomology at the British Museum (Natural History). The principal items now acquired are as follows :—

1. *Abbildungen und Beschreibungen noch unbeschriebener und noch nicht abgebildeter Schmetterlinge.* 8vo. Augsburg, 1785. pp. 16. 3 pls. col.

There is certainly no other copy of this work in Great Britain, and, indeed, the present copy is believed to be unique.* For an account of this work see Sherborn, 1929, Ann. Mag. nat Hist. (10) **4** : 81.

2. *Beitrage zur Geschichte der Schmetterlinge.* 8vo. Augsburg, 1786–1790. 32 pls.

This is Hübner's own copy of this work and contains the original drawings for the 32 plates.

3. *Sammlung auserlesener Vogel und Schmetterlinge,* &c. 8vo. Augsburg, 1793. pp. 16.

The Society have now acquired the text but not the plates of this rare work, the only other copy of which in this country is in the library of the Zoological Museum, Tring.

4. *Sammlung europäischer Schmetterlinge.* 8vo. Augsburg, 1796–[1841].

Much of the text of this work is extremely rare, and the additional text which the Society have now received almost completes their copy of this work. Some of the text is in the original wrappers as issued.

* Since the meeting, Dr. L. G. Higgins informs me that he has seen a second copy of this work, which is in the library of Freiherr von Rosen at Munich.

5. *Geschichte europäischer Schmetterlinge.* [1793]–[1842].

The present collection contains 468 of the original drawings for the plates of this work, which in all number 500. The very rare text of 32 pages is already in the Society's library.

6. *Sammlung exotischer Schmetterlinge.* 1805–[1838].

The Society have now obtained a few of the original drawings for this work, 2 out of the 6 published sheets of text, photostats of 3 other sheets, and 12 sheets of text of considerably later date which were never published. The manuscripts received contain also valuable information regarding the localities of the specimens figured by Hübner in this work.

7. *Tentamen determinationis, digestionis atque denominationis singularium stirpium Lepidopterorum, &c.* 8vo. Augsburg [1806].

The Society have now received not only a copy of this extremely rare work but also the original manuscript of it.

8. *Verzeichniss bekännter Schmetterlinge.* 8vo. Augsburg, 1816–[1826].

The present collection contains a portion of the original manuscript of this work.

9. *Zuträge zur Sammlung exotischer Schmetterlinge.* [1809], 1818–[1837].

Some of the original drawings of this work are included in the present collection.

10. *Lepidopterologische Zuträge.* 8vo. Augsburg, 1820. pp. 32.

Part of the original MSS. of this work is included in the present collection.

11. *Index exoticorum Lepidopterorum.* 4to. Augsburg, 1821. pp. 8.

Two copies of this pamphlet, one of them Hübner's own with some annotations, with the original MSS., are included.

12. *Systematische alphabetisches Verzeichniss.* 8vo. Augsburg, 1822. pp. 81.

The collection contains part of the original MSS. of this work.

13. *Catalogue des Lépidoptères de la collection de M. Franck.* 8vo. Strasbourg [1826].

Some of the MS. of this work has been received.

In addition to the above works all of which are enumerated by Hagen (1862, Bibl. ent. **1** : 387–389), the following printed works not noted by him are included in the present collection :—

14. *Verzeichniss europäischer Schmetterlinge.* 8vo. Augsburg, 1791.

Only this copy of the title page of this work is known. See Sherborn 1929, Ann. Mag. nat. Hist. (10) **4** : 81.

15. *Der Schmetterlinge Lepidoptera Linnei.* 8vo. [n.pl.] n.d. pp. 16.

Hübner's annotated copy of this work has been received. The only other known copy is in the British Museum (Natural History).

16. *Erste Zuträge zur Sammlung exotischer Schmetterlinge.* 4to. Augsburg, 1808. pp. 8.

This is the only known copy of this work outside Germany.

Finally, the collection now received contains two items of very great interest. Of these, the first are four original drawings of plates of butterflies and moths on which Hübner wrote " My first attempts—Jacob Hübner, 1784." The second of these is a small notebook containing notes by Geyer of the greatest importance regarding the dates of publication of the plates of the *Geschichte europäischer Schmetterlinge* and of the *Sammlung exotischer Schmetterlinge.*

Larvae of *Nacerda melanura* L. in piles of pitch pine. By Dr. K. G. Blair.

The larvae, which were sent for determination by the Curator of the Hancock Museum, Newcastle-on-Tyne, were found in piles of pitch pine belonging to the Newcastle and District Electric Lighting Company, sunk to a depth of about 5 ft. below surface level. The piles were driven in 1915 and encased in concrete and brickwork. The sender was of opinion that it was impossible for the insects to get at the piles owing to this casing, and suggested that the eggs or young larvae must have been in the wood when the piles were driven twenty years ago. One objection to this theory is that the beetle usually prefers water-soaked wood, especially that buried in the ground—it is particularly addicted to the groynes used for beach protection—and the timber when the piles were driven would not be in a condition suitable for oviposition by the beetle, whereas it would have been in such condition for the past few years, yet there was no sign of them in the unencased lower portion of the piles below about 7 ft. Another objection is that though certain Longicorn larvae living in dry, seasoned wood have been known to live even longer than this, yet there is no reason for supposing that such a prolonged life-cycle occurs in *Nacerda*.

Some ancient Beetles from Egypt and Mesopotamia. By Dr. K. G. Blair.

At our Meeting on 5th Dec. 1917, Dr. Gahan exhibited a specimen of *Calosoma rugosum* Deg., found in the stomach of a mummied Ibis the age of which was estimated at some 3,500 years. Though somewhat broken the condition of the chitin of this beetle was scarcely different from that of a modern specimen. *C. rugosum* occurs over practically the whole of Africa.

Recently two beetles were submitted by Mr. H. O. Myers from a Predynastic tomb at Armant, Upper Egypt, dating approximately from 3,500 B.C. These beetles were *Ocnera hispida* Forsk., a common desert species of North Africa and S.W. Asia to-day. Among the ornaments found in the tomb was a necklace of which each bead was the thorax of the Buprestid beetle *Steraspis squamosa* Klug, while on another the femora of apparently the same species of beetle were strung. The chitin of all these beetles was now very thin and frail, and the thoracic sutures were open so that the sternal portion was disconnected from the notum. The colour also was altered, the black of the *Ocnera* being decidedly brownish, while the brilliant green thorax of the *Steraspis* was black, tinted with purple in the hollows.

Very shortly after, a beetle was received from Dr. H. Frankfort, of the Oriental Institute, found in the bitumen floor of an Early Dynastic house dating from about 2,500 B.C., now being excavated at Tell Asmar, Mesopotamia. This specimen was in a very different condition, consisting of a bitumen cast of the inside of the hind-body of the beetle. So far as can be seen it would correspond to the internal surface of the hind-body of a modern specimen of the Tenebrionid *Scaurus macricollis* All., again a present-day inhabitant of the same region.

Beetle remains from a block of Peat on the Coast of East Anglia. By Dr. K. G. Blair.*

The fragments, originally reported as from the peaty layers of the Forest-bed Series exposed beneath the boulder-clays at the foot of the cliffs on the Suffolk coast,

* Communicated on behalf of Mr. Claude Morley.

were found by Mr. Philip E. Rumbelow of Yarmouth, were later ascertained to have been found in a block of peat cast up on the shore at Caister. The following species have been identified: *Rhysodes sulcatus* F., *Pterostichus vernalis* Panz., *Pt. strenuus* Panz., *Agabus unguicularis* Thoms., *Ilybius guttiger* Gyll., *Aleochara* sp., *Olophrum piceum* Gyll., *Dryops griseus* Er., *Donacia simplex* F., *Plateumaris discolor* Panz., and a larva of *Corymbites pectinicornis* L., besides various unrecognised fragments. Of the above the most noteworthy is *Rhysodes sulcatus*, a species no longer found in Britain, its present distribution being southern Europe, from the Pyrenees to the Caucasus, extending northward through Hungary and Austria only to South Germany. The other species all now exist in Britain.

The condition of the material is very similar to that of the "moorlog" of the Dogger Bank, and the species are of similar habit to those recorded from that deposit.* Mr. Rumbelow reports that this peat is from time to time thrown up in considerable quantities, but in a limited area extending to about half a mile of shore, thus suggesting that it is of quite local origin. Such a deposit, supposed to be contemporaneous with, if not in continuity with, that of the Dogger Bank, is known to occur off the coast in this vicinity.

Discovery by L. Glauert, of the mimetic resemblance borne by a female fly (Mydaidae : Diptera) to the paired sexes of an Aculeate model (Thynnidae : Hymenoptera), on a small W. Australian island. By Sir Edward Poulton.

In this most interesting and, as I believe, novel example of mimicry the small male Mydaid fly (*Miltinus musgravei* Mackerras) exhibits the black-and-yellow pattern with banded abdomen, characteristic of so many Aculeate models in Australia and other parts of the world. The much larger female Mydaid possesses a similar pattern, modified so that the posterior section of the abdomen—about a third of the insect's length—is brownish orange and black instead of yellow and black, thus suggesting the appearance of the banded male Thynnid (*Elidothynnus melleus* Westw.) *in copulâ* with its small brownish female. "The colour resemblance, which," as Mr. Glauert wrote, 3 December, 1934, "is still fairly close, was much more so when the insects were alive. I am under the impression that both forms are flying at about the same time, the models being far more abundant than the mimics." Both were observed and captured on "Rottnest, a small island about eight miles by three, and ten miles west of the mouth of the Swan River. I had seen the fly on the island before I was struck by the mimicry, but only occasionally specimens were noticed. On a subsequent occasion when engaged in making a representative collection of the Thynnids, particularly males and females together, I was astonished to find that one of my supposed Thynnid couples was a Mydaid fly. The wasps and the flies were on the flowers of *Melaleuca pubescens* Schau. (= *M. preissiana* Schau.), where they appeared to be feeding."

The orange tint which—combined with the black ground and replacing the yellow spots—brings about the resemblance to the female Thynnid, is produced by the spread and dorsal extension of a colouring present on the lateral and ventral surfaces of the abdominal segments in both sexes.

It will be observed that this mimetic resemblance is not to a stinging model, for the position of the paired female would prevent the use of this weapon. There

* H. Whitehead, 1920, *Essex Nat.*, **19** : 242–244.

are, however, reasons for concluding that males of Hymenoptera possess other qualities which render them suitable as models. A brief discussion of this subject was suggested by the capture, in a single sweep of the net, of 19 male bees belonging to 5 species of *Sphecodes*, together with a single Tachinid fly, *Ocyptera brevicornis* Lw., beautifully mimetic of the pattern common to the stingless models (1904, *Trans. ent. Soc. Lond.*, **1904** : 644–649).

The five specimens exhibited to the meeting were brought from Australia by my friend Miss L. E. Cheesman. The male and female model, *Elidothynnus melleus* Westw., determined by Mr. R. B. Benson, had been taken on Rottnest island by Mr. Glauert, 6 March, 1932, and the male and 2 female Mydaidae, *Miltinus musgravei* Mackerras, 5 March, 1934, "at a time when the Thynnids were also quite abundant."

The Mydaid fly was determined by Mr. Glauert as the species described by Mackerras in 1928, *Proc. linn. Soc. N.S.W.*, **53** : 539. In the above-mentioned letter, Mr. Glauert wrote :—"Dr. Mackerras was here a few weeks ago, I showed him the fly and he expressed the opinion that the identification was correct, although the type locality is Adelaide, about 1600 miles away."

Miss Aubertin, who has examined the specimens, considers that they are very similar to *M. concinnus* Macq., as determined by Maj. Austen.

In preparing this communication I have received much help from my friends Miss D. Aubertin, M.Sc. (Mrs. Dineley), Mr. R. B. Benson, M.A., and Dr. B. M. Hobby, D.Ph.

Mr. Glauert, Curator of the West Australian Museum, Perth, is much to be congratulated on his interesting and surprising discovery.

[I have received the following additional information sent by Mr. Glauert in a letter written 9 April, 1935.—E. B. P.]

"In reply to your letter of March 13th concerning the position assumed by the Thynnids when in union, the female was, in every case that I noticed, curved downwards with her thorax roughly parallel to the under-surface of the abdomen of the male, which she grasped with her legs. When united in this way the couple would fly from flower to flower, the male would often feed and at times I have seen the female let go of the abdomen of her partner and also investigate the flowers. The trees visited were *Melaleuca preissi* (*pubescens*). Whilst in this position, of course the female could not use her sting, but when the pair were captured they would rapidly disengage, and then she could use it to some purpose, as I experienced to my cost. The effect was painful and lasted for some time, perhaps a quarter of an hour or more, but on this I am rather hazy, as I generally attempted to direct my attention to further collecting and not concentrate upon the pain.

"As regards the *Miltinus*, a curious feature which I think I mentioned in one of my letters was to the effect that the fly generally, if not always, for I am not quite certain of this, carried the tip of the abdomen bent downwards, a peculiarity which made the resemblance to the wasp all the more striking.—L. Glauert."

"Myasis" of Flamboyant Acacia Tree. By T. A. M. Nash.

[Sir Edward Poulton communicated the following notes contained in a letter written by Mr. T. A. M. Nash, 30 June, 1934, from Gadau (*viâ* Jos), N. Nigeria, to Sir Guy Marshall.]

Since the rains broke some of the Flamboyant Acacia trees on the station have been streaming sap from minute crevices in the bark. Sap and bubbles of air can be seen exuding. Crystals, of what looks like sugar, form all round these spots which are infested with Dipterous larvae. The branches are spotted with Dipterous eggs, the moist parts are swarming with *Chrysomyia* adults and adults of other species, but quite 98% of a catch are *Chrysomyia* spp.* The larvae are clustered around the minute cracks from which the sap exudes, their anterior ends buried in the cracks.

I have never yet seen any larvae bigger than those sent. Enclosed is a twig, and between the two cuts made on the wood is a typical fissure which was swarming with larvae, but they fell off when the twig was put in spirit (70% alcohol). I presume that the most natural explanation is that these trees are ailing, and possibly some fungus disease has caused the loss of sap. This sap is exceedingly attractive, and adults come from all around to feed on it. The females oviposit and larvae hatch and appear to feed on the sap, although they never seem to attain any size, and possibly cannot complete their development on such food. Of course the explanation may be that the flies are attracted to these trees, oviposit, and the larvae bore into the soft bark and greatly increase the escape of sap; but I do not believe this for a moment, as some of the crevices are on branches 4″ in diameter with very hard bark. On many branches the leaves have died and become brown, and on some the bark has split very badly, but there is no loss of sap from these large openings. Parts of the trees look very healthy, despite small fissures with their sap full of air-bubbles and larvae, so that the withering of certain branches is I think merely a symptom of the general disease.

The whole subject is quite new to me.

A new form of *Acraea althoffi*, Dew. By Professor G. D. Hale Carpenter.

Mr. T. H. E. Jackson, F.R.E.S., has given to the Hope Department of the Oxford University Museum a selection from a large collection made by him in the Budongo forest, 1934, from August 17th to September 6th. Previous investigations had shown that it was an unusually interesting locality (1933, *Proc. R. ent. Soc. Lond.*, **8** : 109) and I hope to communicate at an early date an account of the series of Acraeines and mimics collected by Mr. Jackson. Meanwhile the following description of a new form of *Acraea althoffi* is given.

***Acraea althoffi*, ♀ f. *budongensis*, form n.**

Resembles the form *telloides* Eltr. except that the pale subapical spots in areas 3, 4, 5, 6 of the fore-wing are white instead of tawny orange.

* A part of a sample catch obtained by the author from one sweep of the net contained 7 *Chrysomyia putoria* Wied., 2 *Chrysomyza* sp., and 2 *Musca* sp., determined by Miss D. Aubertin and exhibited to the meeting. The *Chrysomyia* were rather smaller than the average size of this species in the British Museum series. Miss Aubertin (Mrs. Dineley) has reported on the larvae from the sap—"They appear to be 1st or 2nd instar *Chrysomyia* larvae, evidently attracted by the unhealthy sap, which is really quite unsuitable for them to breed in. (Analogous to attraction of blow-flies to foul-smelling flowers.)" It would be interesting to ascertain whether these larvae produce puparia yielding imagines, and if so to examine them for abnormality in size or in other respects.—E. B. P.

A close parallel is provided by a similar form of *Acraea jodutta dorotheae*, with white subapical patch, and an interesting feature of the collection made by Mr. Jackson is that these two forms bear considerable resemblance to the little-known *Planema schubotzi* Grunb., already reported from that locality (*loc. cit.*) and apparently not uncommon there. Further details of this association will be communicated when figures have been obtained: the following specimens were exhibited.

Acraea althoffi, ♂ 20; ♀ form (1) *drucei* Eltr., 5; (2) *althoffi* Dew., 17; (3) *telloides* Eltr., 8; (4) *ochreata* Eltr., 13; (5) transitional between the last two, 2; (6) *budongensis*, form n., 4; total 49.

The males show variation in three points. A. The pale spot on the fore-wing in area 3 may be all red, or may be powdered with yellow externally. In the former case an approach is made to the form *bitjana* B.-B. (1926 *Ann. Mag. nat. Hist.* (9), **17** : 384. B. The red patches on the fore-wing in the cell and area 2 may be separated by a black bar or may be continuous owing to absence of the distal end of the black bar. This latter, again, is an approach to *bitjana*. C. The pale triangles contained within the forked internervular rays at the margin of the hind-wing may be quite clearly shown above, or may only be visible beneath.

Female form 1 is like the males: the subapical pale area may be red or white. Female form 2, black and white, resembles *Acraea jodutta* female form *jodutta* F. There is variation especially in the depth of blackness of the broad marginal band to the hind-wing: one specimen having the inner two-thirds of the band so little black, and also the black at the base of the fore-wing so much reduced, that it is obviously the kind of variant from which has been developed the form *lycioides* described by the writer from the Sese Isles, L. Victoria (1932, *Proc.*, **6** : 64). Female form 3, tawny orange, resembles the female form *dorotheae* E. M. Sharpe of *A. jodutta*. The tawny-orange areas on the fore-wing vary in depth of colour and may be transitional to form (4). In some cases the subapical pale area is considerably paler, tending towards white. One such female was taken *in copulâ* with a male. Female form 4, pale yellow, resembles the *male A. jodutta*: transition from a very pale specimen to the white form is often seen.

It is of some interest to note that one of the specimens of female form *ochreata* bears very distinct imprints of a narrow beak of a bird on the fore-wings, clearly visible on both sides of the wing. Two attacks must have been made, in one case involving both fore-wings together, the other one wing only.

The male form of *althoffi* taken by Neave in the Daro forest in Western Uganda and named *neavei* by Poulton (1924, *Proc.*, **1924** : cxliv), with the red of the fore-wing and white of the hind-wing replaced by orange, was not taken by Jackson in the Budongo forest.

The above-named forms comprise all the known forms of *A. althoffi* except the rare *pseudepaea* Eltr., and *rubrofasciata* Auriv., which occurs in the Congo and Cameroons and is considered by Gaede to be a distinct species (1915, *Int. ent. Z.*, **9** : 111). This form has the band of the hind-wing red.

Finally a comparison may be made with the series from Entebbe described by Poulton (1911, 1er *Congr. Int. Ent. Bruxelles*, 1910, **2** : 504–506) in which there were males 15, female forms *telloides* 8, *althoffi* 2, *ochreata* 1.

A variable series of *Sinna calospila* Walk., from Java with a description of three new forms. By Dr. Karl Jordan.

A series of 41 specimens of the Noctuid *Sinna calospila* Walk. (1865) collected by J. P. A. Kalis and A. M. R. Wegner in the mountains of East Java at altitudes varying from 4000 to 6000 ft. were exhibited. At first sight, the series suggests that it consists of several species; in fact, one of the colour-forms has been described by Hampson as *Sinna atrofusa* (cf. Hampson 1912, *Cat. Lep. Phal. Brit. Mus.*, **11** : 467). The occurrence of intermediates, the great individual variability of the forms of which there are a number of examples, and the identity of the genitalia leave no doubt that the specimens belong to one species only. The sexes differ in the hind-wing being buffish in the ♂ and white in the ♀, and some of the colour-varieties are evidently sex-limited, the exhibit consisting of the following forms :—

(1) Network of markings of fore-wing (above only) scarlet; both sexes.—f. *calospila* Walk.

(2) Network yellow; one ♂ only.—♂ f. **flava** form. n.

(3) Network drab brown; ♂♂ only.—♂ f. **fusca** form. n.

(4) Network red, interspaces black; both sexes.—f. *atrofusa* Hamps.

(5) Fore-wing white, markings absent or confined to apex and distal margin; ♀♀ only.—♀, f. **alba** form n.

The Continental subspecies was described by Elwes as *S. dohertyi* (1890).

Two African Agaristids. By Dr. Karl Jordan.

Two species of Agaristinae, a subfamily of Noctuidae, were also exhibited. Most of the species are gaily coloured and known to be day-fliers, some black and yellow Neotropical species, however, being on the wing at night. Judging from the bright colours of *Paida pulchra* Trimen (1863), which I obtained in Damaraland, one would have expected to find it in day-time at flowers; but the species came to the lamp, and when disturbed in day-time behaved exactly like a Noctuid, darting away and seeking quickly the shelter of tufts of herbage under low bushes. *Xanthospilopteryx pardalina* Walk. (1869), on the other hand, behaved like a butterfly. It was frequently observed in the hinterland of Porto Amboim in Angola below the steep escarpment, about 50 miles from the coast. It occurred at the road-side on flowering shrubs and at a distance of 10 yards looked, in the dazzling sunshine, like the black and yellow butterflies of the genera *Byblia* Hübn. (1818) and *Eurytela* Boisd. (1833) which were very much in evidence at the same place. The Agaristid, however, though very restless, revealed itself as a moth by its less fluttering flight.

Three uncommon European butterflies. By Dr. L. G. Higgins.

The following butterflies were exhibited with related forms for comparison.

1. *Agriades aquilo* (Bdv.) taken this year in Norway. The transition to *A. glandon* (de P.) which exists in the race *A. g. aquila* Gerh. (= *alboocellata* Gillm.) of Bavaria and N. Tirol is very interesting. The latter resembles *aquilo* very closely on the under surface, but the specific identity of the two forms is not yet established, as they diverge somewhat in the male genitalia and in the androconial scales.

2. *Melitaea athalia norvegica* Auriv. from the Dourefjeld. This very distinct and small form occurs on moors and is very similar to *M. athalia suessula* Fruhst. from the moors of Bavaria, specimens of which were also exhibited. The insect, which has received many names, was definitely associated with *athalia* by Wahlgren as long ago as 1912 (*Ent. Tidskr.*, 33 : 77). The genitalia as well as the general habitus, are somewhat atypical, and if it is really a form of *athalia* it is probably a well-defined subspecies.

3. *Erebia alberganus* (de P.) (= *ceto* Hb.). A specimen of the race *phorcys* Freyer was exhibited, taken in the Balkans in 1933, contrasted with typical *alberganus* and with the little *caradjae* of the Engadin. The very large *phorcys* was extremely scarce in this country, and he did not know of another specimen. It was described nearly a century ago, but only lately was its habitat in the Balkan Mountains certainly known. Its occurrence here, about 700 miles from the nearest Alpine locality, in quite a different mountain system, was very astonishing. Unfortunately he had to leave the locality before the main emergence, and obtained only one precocious specimen.

***Phylloxera* on vines, a new British record.** By G. Fox-Wilson.

The recent occurrence of *Phylloxera* in Berkshire is worthy of record for it indicates that the pest can survive under exceptional conditions in England.

During November 1934, the roots both of a pot Vine and of an established rod (var. " Black Alicante ") in a vinery were submitted to me from a private garden in Berkshire, with the statement that the roots were infected with Root-Knot eelworm, *Heterodera marioni* Goodey. A critical examination of the roots resulted in the discovery of the subterranean form ("*radicolae*") of the Vine Louse, and of some free-living nematodes. Material was submitted to Mr. J. C. F. Fryer, M.A. (Ministry of Agriculture's Plant Pathological Laboratory, Harpenden), and to Dr. T. Goodey (Institute of Agricultural Parasitology, St. Albans) for their opinion; the former confirmed the presence of *Phylloxera*, the latter stated that there was no evidence of eelworm infection.

Some variation existed in the size of the individuals; the average measurements being :—length, 0·35 mm., breadth, 0·21 mm.

There are two types of root-galls, viz.—(I) small galls or nodules situated near the tips of the young rootlets; and (II) large swellings upon the older rootlets and roots. The former are more common and are less injurious to the plant.

A visit was paid to the garden on the 2nd January, 1935, and it was ascertained that the Vines " never had done well " over a long period of years, though new rods flourished for a year or so following planting-out in the borders—the effect of the presence of "*radicolae*" on the roots being comparable to that of root-pruning. Later, however, the strain of bearing a heavy crop with a diseased root condition resulted in a chlorotic condition of the foliage and reduced vigour. The infestation was more severe on pot plants than on established rods growing in the borders—this fact agrees with the theory that shallow roots are more susceptible to attack than deep roots. The leaf-form ("*gallicolae*") has not been observed in these gardens, though mention is made of leaf-infestations in the earlier British records.

Without doubt the pest has persisted in these vineries for a considerable

number of years, for new plants which were introduced to replace the unhealthy rods were obtained from a reliable firm in whose nurseries the pest has at no time existed.

It is unnecessary to outline the biology of *Phylloxera*, for the literature concerning it is extensive and is readily available (*vide* B. Grassi, 1915, *Month. Bull. agric. Intell. Pl. Dis., Rome*, **1915 :** 1269–1290).

The first record of *Phylloxera* in England was made by Westwood in 1863 (*Gardnrs Chron.*, 20th June, **1863 :** 584) from material collected at Hammersmith by the Rev. M. J. Berkeley. Westwood refers again to the outbreak in 1869 (*Gardnrs Chron.*, 30th January and 26th June, **1869 :** 109, 687), when he gave the insect the name of *Peritymbia vitisana*. It would appear that the presence of *Phylloxera* in England antedated its discovery on the Continent by nearly two years.

The last recorded outbreak is made by T. H. Middleton (1914, *Ann. Rept. Hortic. Br., Bd. Agric. Fish.*, **1912–1913 :** 48–49), and the following statement is made concerning it :—" The pest, though it can survive under exceptional conditions in England, spreads extremely slowly, never assumes epidemic proportions and takes many years to kill a plant, while many Vines in immediate contact are never affected. There is no reason for supposing that this pest can ever become a serious menace to English viticulture."

The accompanying map shows the distribution of *Phylloxera* in the British Isles so far as can be ascertained.

This pest is scheduled under " The Destructive Insects and Pests Order of 1922," and its presence must be reported to the Ministry of Agriculture, 10 Whitehall Place, London, S.W. 1.

My sincere thanks are due to Mr. F. Laing, M.A. (British Museum, Natural History) for supplying me with information regarding the generic name of the Vine *Phylloxera*. He states (*in litt.*) :—" Shimer published in 1866 two articles in the *Prairie Farmer*, for photostat copies of which I am indebted to Dr. Harold Morrison, U.S. Bureau of Entomology, namely on the 3rd November, p. 290, and 8th December, p. 365. In the former he refers to the ' Grape-leaf Louse,' called *Pemphigus vitifolia* [sic] by Fitch, and to another belonging to the same genus, occurring in galls on the Pignut Hickory to which he gives the specific name of *globosum*. He notes the resemblance of both to the genus *Phylloxera* Fonsc., as defined by Walsh but not by Westwood, and states that he has embodied his observations, creating a new genus and a new family, in a paper which has been offered for publication to the *Practical Entomologist*. In the second article on 8th December, headed ' Grape-leaf Louse—*Daktulosphaira vitifoliae*,' he records that Walsh refused to publish his paper in the *Practical Entomologist*, gives, amongst other notes, a generic description and states that ' I have included it under my genus *Daktulosphaira*, and by that name it may be known instead of *Pemphigus*.' In January of the following year, he read a paper, presumably the one rejected by Walsh, where he described the genus *Dactylosphaera* and, in a footnote, says that ' in case, however, the characters given above should be sufficient to separate, generically, *vitifoliae* from *D. globosum*, I would propose the generic name of *Viteus* for the former ' (1867, *Proc. Acad. nat. Sci. Philad.*, **1867 :** 2). The names *Daktulosphaira* and *Dactylosphaera* are derived from the same source; apparently what happened was that

Shimer had *globosum* and various other Phylloxerids classed together under the generic name of *Daktulosphaira* ; that for the purpose of a semi-popular paper he issued an article on the Vine species in December under the name of *Daktulosphaira vitifoliae* and included a generic description, but when he came to give his paper to a scientific society a few weeks later he realised that his generic name was not correctly formed and substituted *Dactylosphaera*. He then found that the species he had included in this genus were not all congeneric, and restricted it to *globosum*, as type, erecting *Viteus* for *vitifoliae*. I suppose, however, that on account of his previous

Legend to Map.

H. 1863.	Hammersmith (first British record).	L. 1883.	Lancashire.
C. 1867.	Cheshire.	S. 1884.	Surrey.
W. 1867.	Co. Wicklow.	S. 1904.	Sussex.
D. 1868.	Derbyshire.	1905.	Dublin.
G. 1876.	Gunnersbury, Middlesex.	K. 1907.	Kent.
D. 1876.	Dumfries.	H. 1908.	Hertfordshire.
M. 1878.	Monmouthshire.	B. 1911.	Berkshire.
B. 1878.	Buckinghamshire.	G. 1912.	Gloucestershire.
I. 1880.	Inverness.	B. 1934.	Berkshire.

paper in the *Prairie Farmer* the genus *Viteus* becomes automatically a synonym of *Daktulosphaira*, though this, no doubt, is contrary to what Shimer intended, and those who do not regard the Vine species as belonging to *Phylloxera* have this generic name ready to take its place. There is sufficient difference in the spelling of *Daktulosphaira* and *Dactylosphaera* to allow both to stand, though really on the evidence it seems to me that the latter could be regarded as an emendation of the former; this course would make for further complication, however.

" Now, with regard to the specific name. A survey of the old literature shows that there was a good deal of controversy between Shimer, Walsh and Riley, and the latter especially, while admitting that *vitifoliae* was the earliest name and had priority over *vastatrix*, refused to recognise Fitch's name in his later writings. We, however, can ignore the polemics and restore the specific name of *vitifoliae*, as has indeed been done by more than one aphidologist. The name of the Vine Phylloxera, therefore, is *Daktulosphaira vitifoliae* (Fitch)."

Photographing insects in proportionate size. By C. Rippon.

Some years ago I got very dissatisfied with the slides generally available for illustrating lectures on the British Lepidoptera. There was no proper proportion in size between large and small insects; on the screen they appeared in some cases the same size and in others a very small insect was reproduced actually larger than a big one. Further, quite a number of photos were of set specimens and of larvae in unnatural conditions. Having done a good deal of photography in my younger days, I tried to find suitable apparatus for taking pictures of insects alive, in their natural surroundings, and of strictly proportionate size. About four or five years ago I at last found the camera I wanted, which was light and compact for field work and yet had all the necessary movements with double extension, requisite lens aperture, etc.

I have now about 400 slides in monochrome of the British Macrolepidoptera, which I am continually adding to as I find or obtain further species as larvae, pupae or perfect insects. All the photos are of living insects in their natural surroundings and characteristic positions, and are all in exact proportionate size.

After I had been at this work for some time I was tempted to try to do the same thing in actual colour photography. As colour work necessitates an exposure thirty times that for monochrome the difficulty of getting good results was largely increased, particularly of such subjects as butterflies with their wings spread; and in addition the latitude of exposure for colour is very much smaller than in monochrome. I found, however, that the results were well worth the extra trouble, while in some cases only a colour photo could show the apparent power of some larvae to assume different colouring to suit special surroundings.

The slides shown were selected from both the monochrome and colour series to illustrate the points mentioned.

Wednesday, March 20th, 1935.

Dr. S. A. Neave, O.B.E., President, in the Chair.

Election of Fellows.

The following were elected Fellows of the Society :—Mahmoud Effat, Beni-Swaif (Halabiyah), Egypt; Albert Reginald Daniel, Alwyn, Dove House Lane, Solihull, Near Birmingham; John Stainer, Endcliffe, Henbury, Near Bristol; George Loftus Windred, B.Sc., Colonial Sugar Refining Co., Lautoka, Fiji.

Obituary.

The death of Professor W. Benham, F.R.S., elected a Fellow of the Society in 1915, was announced.

Exhibits.

The following communications were made to the meeting :—

The white Arctiid Virginian Tiger-moth, *Diacrisia virginica* Fabr., refused by young Purple Martins. By Miss E. A. Oehlenschlaeger.

[Communicated by Sir Edward Poulton, who said that this interesting addition to the results described in our 1932, *Proceedings*, **7** : 98, 99, had been quoted from a letter, written 12 Febr., 1934, from Milwaukee, by Miss Oehlenschlaeger. *D. virginica* was given the acceptability rating of 71·4 by Dr. F. Morton Jones.*]

The Virginian Tiger-moth flies at night, and I thought several specimens would make a " good-night snack " for one of our 1934 Martins. It was refused : when I put it to my nose I did not blame the bird in the least !

Here is a white insect, going about its livelihood at night, very evilly odoriferous. Does not this denote a warning colour ?

The moths were named by Mr. T. E. B. Pope, Curator of insects, etc., in the Milwaukee Public Museum, who wrote : " the larva is the Yellow-bear of our gardens. The dense, long hair of some individuals is, however, white and of others reddish."

Notes on Japanese insects and their enemies. By Rev. E. G. Bucknill, M.A.

[Communicated by Sir Edward Poulton, who said that the observations were recorded in a letter written by his friend, 4 February, 1935, at Yokohama.]

There are three passages in the *Proceedings* for 29 December, 1934, which invite comment from a resident in Japan :—

p. 58. I think I have told you in a previous letter how, on releasing a bulky newly-emerged moth of the " Eggar " type in this garden, I saw a sparrow take it in mid-air, about 8 ft. from the ground, and carry it out of sight. The ubiquitous sparrow of Japan is the Tree-Sparrow of Gt. Britain.

p. 66 (6). I have seen a Mantis devouring the full-grown larva of *Papilio sarpedon* Linn., in this city : also even a frog in the hills near by.

p. 71. In my diary under Takayama (N. Japan), 20 July, 1934, I find this entry, " Saw dragonfly being eaten by web-spider and wasp or hornet simultaneously ! " This was of course in the (large) web of the former : I did not wait to see what happened when the two captors met ! In the Takayama neighbourhood there is one species of dragonfly—black and electric blue, length 2″—which is itself most bloodthirsty : one day, for instance, I saw it devour a smaller dragonfly, biting down into the thorax, the victim's head rolling off in the process.

On Aug. 26 of last year I picked up, near Mount Fuji, the four perfect wings of a fine *Danaus tytia* Gray, not a trace of any other part could be found.

* 1932, *Trans. ent. Soc. Lond.*, **80** : 354, 381.

The Regulation of Moulting and "Metamorphosis" in *Rhodnius prolixus*. By V. B. Wigglesworth.

During its five nymphal stages the morphological characters of *Rhodnius* change very little; but at the fifth moult when it becomes adult there are striking changes in all parts of the body. It is convenient to refer to the appearance of these adult characters as "metamorphosis." Thus, in the growth of *Rhodnius*, there are two phenomena to be considered: simple moulting, and moulting coupled with metamorphosis. Only one meal is necessary in each stage, the insect moulting at a definite interval after feeding. If the head is removed soon after feeding, the insect will not moult—although some of these headless individuals have remained alive more than a year. But there is a "critical period" (about 7 days after feeding in the fifth nymph, about 4 days in the earlier nymphs), after which moulting is no longer prevented by decapitation. The blood of insects decapitated soon after the critical period contains a moulting hormone which will induce moulting in insects decapitated twenty-four hours after feeding. There is some evidence that this hormone is secreted in the corpus allatum, the cells of which show signs of greatest activity during the critical period. The stimulus for the secretion of this hormone seems to be provided by the stretching of the abdomen by the meal, and this stimulus is conveyed to the head by the nerve cord.

The blood of fifth or final nymphs decapitated after the critical period will induce moulting coupled with metamorphosis in earlier nymphs decapitated soon after feeding. Even first-stage nymphs may be caused to turn into diminutive adults by this means. This is explained by supposing that all the nymphal stages produce the same moulting hormone (for instance, the blood of moulting fourth nymphs will induce moulting in fifth nymphs), but that the earlier nymphs, *i.e.* before the fifth nymph, produce in addition an inhibitory hormone which restrains metamorphosis. Thus, if blood from a moulting fourth nymph (not deprived of its head) is allowed to pass into a fifth nymph decapitated soon after feeding, the fifth nymph, instead of turning into an adult, develops into something like a "sixth nymph." The moulting hormone appears to be secreted before the inhibitory hormone; for if the early nymphal stages are decapitated around the critical period, a certain number of them suffer a precocious metamorphosis and develop into diminutive adults; while others show intermediate characters (prothetely)—due, perhaps, to the varying quantity of the inhibitory factor in the blood at the time of decapitation.

These results have been published in full in 1934, *Quart. J. micr. Sci.*, **77**: 191–222.

A new Syrphid larva and some other aquatic insect larvae which obtain their oxygen from plant roots. By G. C. Varley.

The early stages of three species of insects were exhibited. They were found living in mud in the river Cam and they constitute a very remarkable case of convergence in their special respiratory adaptations. The larva of each species pierces the roots of the grass *Glyceria aquatica* Sm., by means of the spine-like hind spiracles and so obtains a supply of oxygen from the intercellular spaces of the plant.

The larva of the Syrphid fly *Chrysogaster hirtella* Loew has not been described * and an account of its structure and habits is being prepared for publication. As in many other Syrphid larvae the body terminates in a telescopic "tail," at the end of which are the hind spiracles; in this species the tail is quite short, and it terminates in a sclerotised needle-like point near the tip of which open the six narrow spiracular apertures. The larva has been discovered with the needle fixed in a root, though more usually the process of washing away the adherent mud dislodges it. The puparium has long horns formed by the prothoracic spiracles and is probably formed on land, since puparia of the same genus have been found in flood refuse.

The puparium of the Ephydrid fly *Notiphila riparia* Mg., is found attached to the roots by two spines on which the hind spiracles open, and in all probability the larva uses the spines in the same way.

The larva of the Chrysomelid beetle *Donacia semicuprea* is abundant amongst the roots of *Glyceria*, and as in *Notiphila* it is provided with two spines which enable it to pierce the roots and put the apertures of its hind spiracles in contact with the gas in the intercellular spaces of the plant.

Wednesday, April 3rd, 1935.

Dr. S. A. Neave, O.B.E., President, in the Chair.

Election of Fellows.

The following were elected Fellows of the Society:—Dr. Wilhelm Junk, Scheveningsche Weg, 74, The Hague, Holland; Professor Clarence E. Mickel, Ph.D., Division of Entomology and Economic Zoology, University of Minnesota, St. Paul, Minnesota, U.S.A.; Frederick George Michael Westropp, 80, St. George's Square, S.W. 1.

Obituary.

The death of Mr. G. H. Gurney, elected a Fellow of the Society in 1906, was announced.

A rare form of *Belenois thysa* Hopff. By Professor G. D. Hale Carpenter.

The late Dr. F. A. Dixey had apparently intended to exhibit the following specimens which were found on his working table in the Oxford Museum prepared for exhibition with a descriptive note dated 13 February, 1934.

The specimens are a male and female of an unusually dark form, the latter having been termed form *rimala* by Suffert, from Bugundi, at the south end of Lake Albert. The male has the marginal black much more pronounced than is usual, and a distinct row of submarginal black spots on the internervular rays of the hind-wing: these characters are more strongly marked than in any wet-season specimens in the Hope Department. The female has the greater part of the upper surface suffused with brownish-black, except for a whitish patch in the centre of the fore-wing, just covering the end of the cell and narrowing backwards

* *C. viduata* is briefly described by Beling, 1888, *Verh. zool.-bot. Ges. Wien*, **38**: 3.

to a small submarginal spot in area 1*b*. Even this whitish patch is heavily suffused with black scales along the veins. The dark scales covering the whole of the hind-wing on the upperside are besprinkled with yellow scales, which just in front of the cell are dense enough to form a yellow patch. The undersides do not differ much from normal, except in a more intense orange.

Both specimens were taken by myself in the Bwamba Valley, the part of the Semliki Valley at the foot of Mt. Ruwenzori which lies within Uganda, on 9 January, 1928. The only specimen in the National Collection was taken in the same locality by Dr. S. A. Neave: the form illustrates well the association of melanism with great humidity in the environment. An intermediate degree of melanism occurs in the form *obumbrata* Weym., which occurs in the neighbourhood of Ruwenzori and Lake Kivu, and is reported by Aurivillius (*in* Seitz) from Zanzibar.

All-female families of *Hypolimnas bolina* L. bred by Mr. H. W. Simmonds in Fiji. By Professor G. D. Hale Carpenter.

The following interesting family was exhibited, bred by Mr. H. W. Simmonds, F.R.E.S., from ova laid by a female captured on Rewa river, Viti Levu, Fiji, 8 August, 1934. The whole series had been presented to the Hope Department, Oxford University Museum, by the generous captor.

The parent, rather battered after captivity, is dark brownish-black with a small orange patch near the anal angle of the front wing in areas 2 (posterior part only), 1*b* and 1*a*, and a faint orange suffusion just beyond the cell in the hind-wing. This is a slight variation from Poulton's form "*euploeoides*," owing to the presence of the orange. The offspring fall into the following categories:

A. Like the parent, but with a tendency to develop blue on the faintly shown oblique patch on the fore-wing, and in the centre of the hind-wing, 5; B. With this blue clearly shown, 3; C. "*euploeoides*." With no orange, and a variable but slight amount of blue suffusion as in A, 10; D. Blue more developed, 2; E. Fore-wing oblique patch and central area of hind-wing entirely blue, 1; F. *naresi* Butl. with the fore-wing oblique bar white, and central patch of hind-wing suffused with blue around the edges, 10; G. As above, but with the orange appearing slightly developed in the anal area of the fore-wing, 2; H. *elliciana* Fruhst., like the last but orange well developed on the fore-wing, 8.

These 41 specimens may be divided into two groups:—

Ia. Not male-like, of "*euploeoides*" form	20
b. Male-like, with white patches	20
Intermediate (specimen E)	1
	41

Or—

IIa. With the *nerina*-orange	16
,, ,, ,, very faintly shown	2
b. Without the orange	23
	41

The dates of emergence of the specimens are as follows :—

No.	Group.	Date.	No.	Group.	Date.	No.	Group.	Date.
1.	C.	7.ix.34	15.	F.	9.ix	29.	C.	11.ix
2.	G.	,,	16.	H.	,,	30.	,,	,,
3.	A.	8.ix	17.	A.	10.ix	31.	,,	,,
4.	F.	,,	18.	,,	,,	32.	F.	,,
5.	,,	,,	19.	,,	,,	33.	H.	,,
6.	,,	,,	20.	,,	,,	34.	C.	12.ix
7.	,,	,,	21.	C.	,,	35.	D.	,,
8.	G.	,,	22.	,,	,,	36.	F.	,,
9.	H.	,,	23.	F.	,,	37.	,,	,,
10.	,,	,,	24.	,,	,,	38.	H.	14.ix
11.	A.	9.ix	25.	H.	,,	39.	D.	15.ix
12.	,,	,,	26.	,,	,,	40.	C.	16.ix
13.	C.	,,	27.	,,	,,	41.	E.	17.ix
14.	C.	,,	28.	B.	11.ix			

As a convenience to those interested in this matter references to the previous communications to the *Proceedings* are brought together, commencing after Sir Edward Poulton's monographic paper on "Mimicry in the Butterflies of Fiji" (1923, *Trans. ent. Soc. Lond.*, **1923** : 564–691; *H. bolina* being considered on pp. 639–664).

Proc. ent. Soc. Lond., 1926, **1** : 29–31; 1927, **2** : 71–74; 1928, **3** : 18, 43–44; 1929, **4** : 75; 1930, **5** : 75–77.

The undesirability of establishing genera based on characters not common to both sexes and of the naming of subgenera. By G. J. Arrow.

The last paper I contributed to this Society was on the subject of Polymorphism in Beetles. I had not then studied the Stag-beetles, but I have since found that they are the most polymorphic beetles known to me. We are all familiar with the remarkable difference between the sexes of the common Stag-beetle. Even in the nineteenth century the great entomologist Marsham refused to believe that the male and female belonged to the same species and gave another name to the female. In many tropical forms the difference is still greater. A well-developed male and a female of the same species may differ in colour, pattern, shape and sculpture, and have entirely different head, legs, antennae, mandibles, maxillae, labrum and labium, in fact it may be impossible to find any single feature alike in both. But a series of males may also be all different, smaller specimens partly bridging the difference between female and large male.

Again there may be more than one form of large male, a long series showing divergence in two or more directions from the simple type represented by small specimens. All this makes the classification of the Lucanidae a very difficult matter.

One of the early attempts at a classification was due to Westwood, who, realising the difficulty of correctly associating the two sexes and the undesirability of founding genera upon features peculiar to one sex, referred most of the species

to a single genus, *Lucanus*, but applied subgeneric names to a number of divisions distinguished chiefly by sexual characters. Later authors, finding these names ready to hand, have treated them as genera and formed many more similar genera for species unknown in Westwood's time. As a result, a female Stag-beetle, unless the male is known, cannot to-day be referred with certainty to any genus, and males of small development are in the same case. Many, nevertheless, have been described as new and generic names chosen at haphazard. The whole group is consequently in a state of confusion.

This state of things has led me, in the paper just accepted for publication by the Society, to suggest two propositions.

1st. That genera founded on features peculiar to one sex, where the other sex is not actually degenerate, are highly inconvenient and ought not to be adopted.

This seems to me so obvious that no argument is necessary.

2nd. That subgenera should not receive names similar to those of genera.

Such names are not admitted for groups superior to genera and there seems no better reason for giving them to inferior groups. Experience shows that such names merely cause difficulties. Some people will use them instead of the generic name, the same insect will be referred to sometimes by one name and sometimes by the other, those without special expert knowledge will suppose them to be different insects, misconceptions of distribution may result, statistics be falsified, and so on.

Another objection to the admission of such names is that they form an inducement to the unnecessary inflation of systematic literature. The invention of such names is the easiest of all ways of achieving immortality. It entails no laborious research, no exhaustive study of the world's literature. If we find a genus containing six species, three of them large and three small, we have only to say "I propose two new subgenera, Macrocarabus Jones, and Microcarabus Jones," and the name of Jones will be enshrined in the catalogues for ever. Another man will soon after find a species which is intermediate and cannot be referred to either, and the necessity for another subgenus Mesocarabus will seem obvious. So the game goes on. To speak of the grandis group and the parvus group would serve every purpose and form no obstacle to a later grouping on a different basis if found desirable. Subdivisions of large genera are of course very necessary, but names for them are not and, in my opinion, they are very objectionable.

The Bacteria Beds of Sewage Works as an Environment for Insects. By Ll. Lloyd.

The bacteria beds of sewage works form a curious environment for insects. Perhaps the nearest approach to them in nature is afforded by a pebble bed, or a moraine, in the spray of a waterfall. They stand like islands, many acres in extent, in the general countryside, and they have certain features which tend to segregate the species breeding in them from their free living congeners. Further, it would be difficult to find two sewage works in which conditions did not differ in at least one important feature. To those who believe that the environment has moulded and still moulds the species they should afford an interesting study. My observations are being made on the beds near Leeds.

The beds are usually six feet in depth and may be raised, or sunk in pits. Raised beds may be walled in, or open-sided. The medium may be pebble, broken stone, slag, clinker, coke or even small coal. The sewage when it reaches them has been freed from all but impalpable solids. It may have only domestic impurities, or its character may be determined by some local industry, as for example the wool washing of Bradford. Its character may be further modified by deliberate chemical treatment, acidified, for instance, or lightly chlorinated. It is distributed by revolving arms which traverse the beds at intervals of seconds

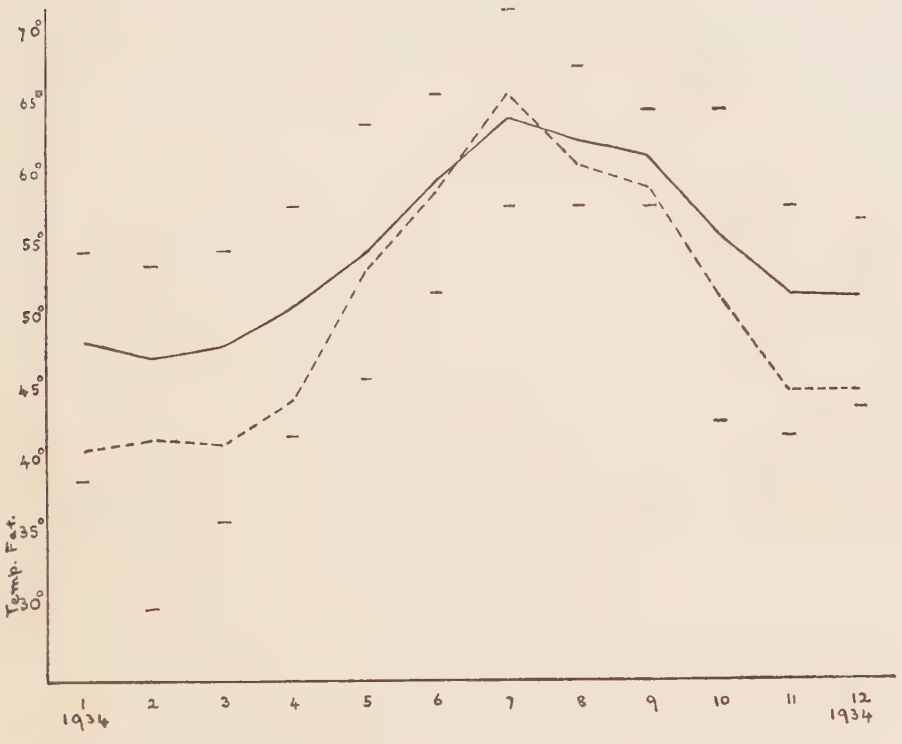

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Diagram 1.—Mean monthly temperatures in Bacteria bed, 3 ft. deep, and range. Mean shade temperature shown by the broken line.

only, or by travelling machines with intervals of perhaps forty minutes. It is the custom to rest a bed for four hours in twenty-four and to give longer rests periodically. One manager will give these rests on a steady routine while another will only rest a bed when it obviously needs it. The water falls on the bed either in jets or in a sheet, but in any case it becomes a gentle trickle amongst the medium. The bed surface may develop a characteristic leathery growth with the alga *Oscillatoria* as its basis, or it may be kept free from this by cautious chemical treatment. Under the combined action of sun and wind, and the activities of insects, worms and birds, this growth is continually fragmenting. The fragments are washed into the depths where they are held up by rubble, and there, together

with a film of bacterial and fungal growth on the medium, and humus, form the staple diet of the insects. Any of the variations of treatment or design may influence the food supply.

The water impinging on the bed is devoid of dissolved oxygen, but on leaving it should be well oxygenated. The oxygen content, however, may not be an important factor in its direct influence as the larvae are not immersed in the water but only washed by it. The atmosphere of the bed is, of course, ordinarily saturated with moisture, and even a very long rest in fine weather does not dry out the bed except just near the surface.

Temperature records in the beds have been taken with maximum and minimum thermometers sunk in lidded pipes to 1 and 3 feet respectively. There proves to

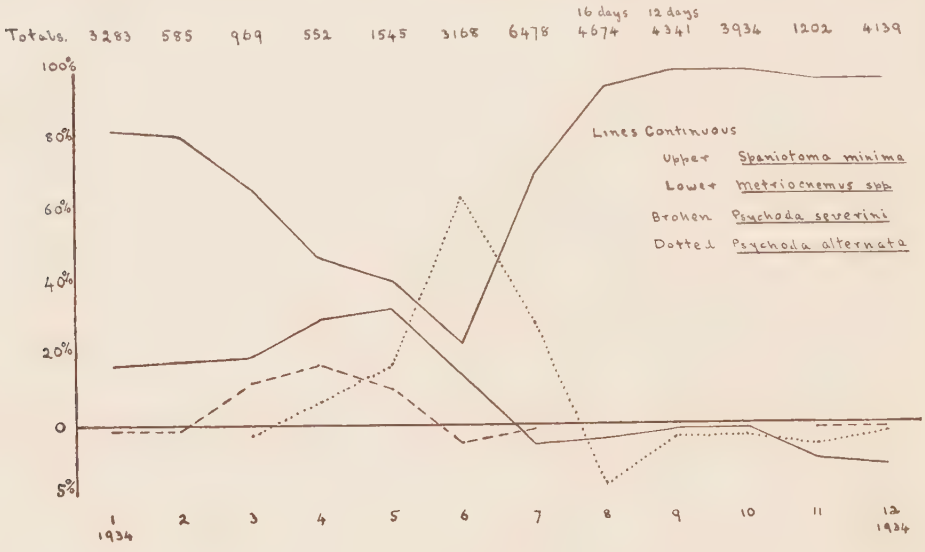

Diagram 2.—Knostrop A3. Analysis of insects trapped, dominant species. Jan.–Aug. 2 traps, Sept.–Dec. 1 trap.

be no important difference in the temperatures at these depths. The monthly mean temperatures are considerably above the shade temperatures except in the height of summer, and the daily range is always much less. (Diagram 1.) Through the last two mild winters frost has been noted only once in the bed on an occasion when a strong keen wind was blowing. The equable temperature in the beds is probably due to the heat of vital processes. It is one of the segregating factors for the insect denizens as it must tend to give them a different season or, in some cases, a much more protracted season than the like species breeding naturally.

Another segregating factor is given by the vast area and the depth of the habitable zone in the beds compared with the shallow zones available to the same species in nature. There is some slight zoning of the larvae in the bed, but one can say that the breeding-ground is almost as the cube compared to the square of a natural habitat. Therefore successful insects breeding in the beds emerge in numbers so vast that inbreeding must be the rule.

An almost unbroken record of the insect output has been kept at Knostrop, Leeds, on one bed for two years, and on another bed for one year; also on the Barnsley Sewage Works, 4 beds for 8 months. Shorter records have been made at Bradford, Huddersfield, Rodley and Shipley. I am much indebted to the Managers of these places for their ready help, especially to Mr. J. T. Thompson of Knostrop and Mr. H. D. Bell and his assistant Mr. C. Wildsmith of Barnsley, the latter having helped me with the laborious insect counts.

The insects are trapped by means of glass jars, cardboard lined and provided with paper cone inlets. The jar is placed over an opening in the face of a wooden tray, 1 ft. square and with sides an inch deep. The tray is let into the surface of the bed and any insect emerging below it, which on emergence seeks the light, should pass into the jar. As a rule the jars are changed twice weekly and the

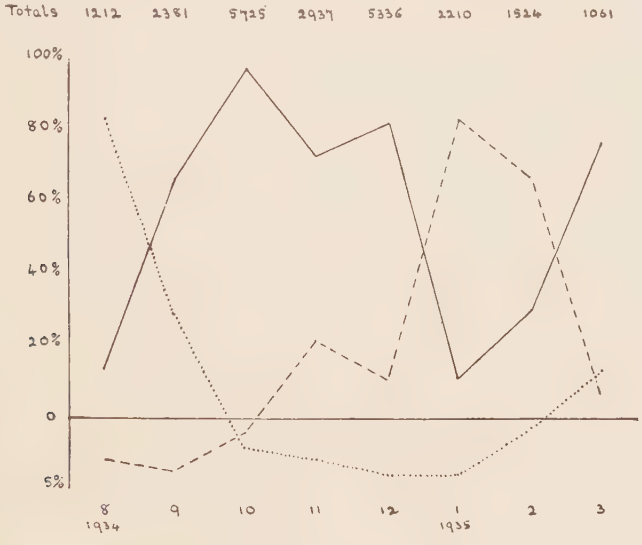

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Diagram 3.—Barnsley bed III. Analysis of insects trapped, dominant species, continuous line *Spaniotoma minima*, broken line *Psychoda severini*, dotted line *P. alternata*.

tray is scraped out and moved to a fresh position on the bed each week. The captured insects are killed with chloroform, spread over a large sheet of paper and counted under a reading glass. Anything difficult or unfamiliar is set aside for closer examination. Most of the species collected have been submitted to the Imperial Institute of Entomology.

The fauna is not rich in species. Over 200,000 insects have been surveyed and about 80 distinct species recognised, but of these 30 occurred only once, and only 2 to 5 individuals were taken of 20 other species. Any or all of these fifty may be stragglers on to the beds. Three species are generally abundant, *Spaniotoma minima* Mg. (Chironomidae), *Psychoda severini* Tonn., and *P. alternata* Say. *Spathiophora hydromyza* Fln. (Cordyluridae) is also general and seasonally abundant but not in comparable numbers. It is well known to be a predator among the active flies (J. W. H. Johnson, "A Contribution to the Biology of

Sewage Disposal," 1914, *J. econ. Biol.*, **9** : 105), and I have found its larvae feeding on the abundant Enchytraeid worms in the beds. Four insects are locally abundant, *Metriocnemus longitarsus* Goet., and *M. hirticollis* Staeg. (CHIRONOMIDAE), *P. compar* Eat., and *Achorutes viaticus* Tulb. The tube-making Chironomids are rarely trapped on the beds but some breed freely in the channels.

The following analysis will give an idea of relative abundance. At Knostrop among 96,000 insects, 81% *S. minima*, 10·7% *Metriocnemus* both species, 1% *P. severini*, 6·6% *P. alternata*; ·3% other Diptera, ·3% Coleoptera, ·03% parasitic Hymenoptera, and ·01% Collembola. At Barnsley the analysis is different. Among 112,000, 50% *S. minima*, there is no *Metriocnemus*, 23·2% *P. severini*, 8·2% *P. alternata*, 18·1% *Achorutes viaticus*. The last named is introduced and cultivated.

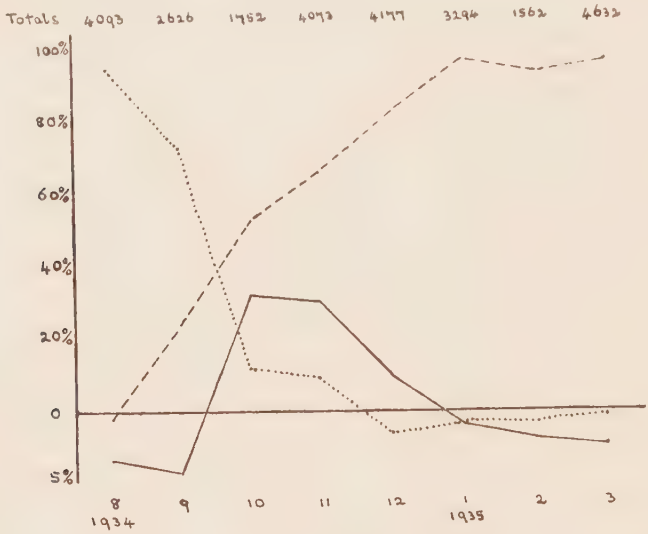

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DIAGRAM 4.—Barnsley bed II. Analysis of insects trapped, dominant species, continuous line *Spaniotoma minima*, broken line *Psychoda severini*, dotted line *P. alternata*.

(See W. H. Parkinson and H. D. Bell, " Insect Life in Sewage Filters," London, 1919.)

The analysis for a complete year of the more abundant species on one bed at Knostrop is shown in Diagram 2. The monthly percentages in the catches are given, the totals being shown at the top. *S. minima* is generally dominant and an output of 1000 per foot per day has been twice recorded. *Metriocnemus* are flies of late autumn and on into early summer, but a cold winter would divide their time of incidence. *P. severini* has similar periods of abundance. *P. alternata* is a midsummer fly but is rarely quite absent. Its curve of incidence is lower than it should be as the fly does not so readily enter the jars.

At Barnsley the systematic trapping starts in August when *P. alternata* is notably dominant. Diagram 3 shows the conditions on three of the beds examined. *S. minima* becomes dominant in September and remains so till December when *P. severini* replaces it. Diagram 4 shows the other bed where

S. minima made only a feeble showing in October and November, while *P. severini* was dominant from the time when the other *Psychoda* went out. The two beds are only a few yards apart and no theory is offered to explain the difference in fly output. The contrast in the charts shows that the rises and falls in numbers are not solely governed by season. *Achorutes* is ignored in these Barnsley analyses as its appearance in the traps is very erratic, dependent apparently on whether the tray is put near a colony.

The *Spaniotoma* yielded by the Barnsley beds this spring, and to some extent by the Knostrop beds, are larger than the series determined by Dr. Edwards as *S. minima*, but I can find no other difference and so have retained them under this name provisionally.

The charts show that one species or another is nearly always markedly dominant, the transitional periods being brief. The dominance is due in part at least to their temperature responses. At our summer temperatures *P. alternata* completes its life cycle in 16 to 20 days and at 85° does so in 7 days (G. M. Fair, "The Trickling Filter Fly," 1934, *Sewage Works J.*, **6** : 966–981; a recent review of the habits and control of *P. alternata*). *P. severini* in my experience never takes less than 20 days and its breeding is inhibited just over 75°, though our Yorkshire beds do not reach such a temperature. Bred in a warm room, T. 67°, in the same jars, broods of *P. alternata* beat *P. severini* by 12 clear days with female offspring slightly in excess, ratio 29 : 24 from 3 broods of each. *M. longitarsus* at moderate room temperatures requires 38 days or more, but one brood at a mean of 71° went through with the wide range of 19 to 34 days and larvae still remaining died off during the following 20 days apparently owing to the July heat. The larvae are very sluggish in hot weather. *Spaniotoma minima* requires about the same time as the *Metriocnemus* and has gone through its life cycle successfully at 71° in the laboratory. There may, however, be a heavy mortality among the Chironomids due to sun heat on the surface stones. Their oviposition is probably mainly near the surface and the pupae of *Metriocnemus* spp. are aggregated in the top 2 to 3 inches, though the larvae feed in the depths. A good deal of information is required before the varying dominance can be explained, not only as to temperature relationships but also as regards the attacks of one species on another when normal food becomes scarce. Larvae of *M. longitarsus* and *S. minima* are apt to eat out their own pupae in the laboratory, and on one occasion larvae of *P. alternata*, accidentally introduced with food into a culture of *P. severini*, destroyed all the latter.

Wednesday, 1st May, 1935.

Dr. S. A. Neave, O.B.E., President, in the Chair.

Election of Fellows.

The following were elected Fellows of the Society :—Richard William Parker, Woodlands, Pen-y-Gardden, Ruabon, Near Wrexham; Roger Verity, M.D., 36, Via Masaccio, Florence, Italy.

The President read the loyal address presented to His Majesty the King on behalf of the Council on the occasion of the Silver Jubilee.

Obituary.

The death of Mr. H. C. Hayward, elected a Fellow of the Society in 1919, was announced.

Exhibits.

The following communications were made to the meeting :—

Unusual length of life and curious site of larva of *Cossus ligniperda*. By O. H. Latter.

On April 6th, 1935, there was brought to me from one of the Godalming Council houses a full-grown larva and part of the cocoon of *C. ligniperda* which had been found in one of the floor-boards; and a few days later the Borough Surveyor, Mr. G. B. Hartfree, kindly had the relevant portion of the board cut out and sent to me. The hollow in which the larva was lying is a crescentic gutter about 5″ long and 1½″ wide; and the surface of the wood has been shallowly rasped a little way beyond one end of the excavation. Mr. Hartfree told me that the board is of *Pinus sylvestris*, and probably of Scandinavian origin, and was laid down in May or June 1929; and that the house was tenanted in July of that year. The board rested on tarmac over concrete, and was itself covered by paper underlying linoleum. It was the removal of the linoleum that led to the discovery of the larva. The most likely explanation of the presence of the larva in such a position appears to be that it had the good fortune when small to be lying exactly between the planes of two successive saw-cuts, and had been in the wood since the tree was felled, probably 1928, or possibly earlier. It is highly improbable that it had eaten its way into the board after the house was built and occupied. It seems, then, as if the larval period of this specimen has lasted about seven years. I hope to be able to record the date of the emergence of the imago, for the larva has established itself in a fresh cocoon in a box in my study.

Two species hybrids in Moths. By Dr. H. Bytinski-Salz.

Reciprocal crosses between *Rhodinia newara* Moore and *Rhodinia fugax* Btlr. were obtained from imported pupae last year by Mr. P. Amiot at Strasbourg. As in the crosses between *Saturnia pavonia* and *S. pyri*, copulation between the small *fugax* ♂ and the large *newara* ♀ was much more easily obtained than the reciprocal one, as the *fugax* ♂ proved to be much more sexually active in captivity than the *newara* ♂; however, one fertile pairing with this species as the male parent was obtained. *R. fugax* occurs exclusively in Japan (and with its subspecies *diana* Obth.),

in Manchuria, Ussuri and Amur, while *R. newara* is confined to the north-eastern part of India: Nepal, Bhutan and Darjeeling. The two species show marked differences in their anatomical structures, as in the female antennae and in the venation. *R. newara* is the type species of the genus *Rhodinia* Stdgr. 1892 (nom. nov. pro *Rhodia* Moore 1872) while *fugax* forms a transition to the nearly allied genus *Loepa* Moore (type: *katinka* Westw. 1847). *R. fugax* shows a pronounced sexual dimorphism, the male being bright reddish-brown, and the female light yellow, while in *R. newara* both sexes are coloured alike. The hybrid shows no sexual dimorphism, being coloured almost exactly like *newara*, which indicates that the brown ground-colour of the *fugax* male probably behaves as a recessive character. In anatomical characters the hybrid closely resembles *R. fugax*, while the pattern on the wings shows a mixture of the characters of both parental species. The table below gives a short description of the hybrid in regard to the characters in which its parents differ.

	Rhodinia newara Moore.	*Rhodinia* $\frac{newara\ ♂}{fugax\ ♀}$.	*Rhodinia fugax* Btlr.
Size, ♂.	118–135 mm.	88 mm.	73–101 mm.
Size, ♀.	122–140 mm.	90 mm.	100–115 mm.
Antennae, ♀.	Distal rami of each segment longer than the diameter of each segment.	As in *fugax*.	Distal rami of each segment much shorter than the diameter of each segment.
Discal veins.	Present, going right through the hyaline ocellus.	As in *fugax*.	Only traces, going along the inner margin of the discal spot.
Ground-colour of the wings, ♂.	Yellow, the costal and central part of the fore-wing and the post-median shadows of both wings suffused with red-brown.	Very much like *newara*, yellow with a deep orange tinge, red-brown suffusion as in *newara*.	Bright rusty red, dark suffusion very inconspicuous.
Ground-colour of the wings, ♀.	Bright yellow, heavily suffused with red-brown as in the male.	As in *newara*.	Light yellow, almost no brown suffusion.
Antemedial band of the hind-wing.	Touches the postmedial band of the fore-wing on the inner margin.	As in *newara*.	More proximal than in *newara*, touches the inner margin of the fore-wing in the middle between the antemedial and postmedial bands.
Postmedial band of the hind-wing.	On the inner margin almost touches the postmedial band of the fore-wing.	As in *fugax*.	Touches the inner margin of the fore-wing half-way outside the postmedial band of the fore-wing.
Postmedial shadow in the ♀.	Very conspicuous.	As in *newara*.	Almost obsolete.
Dentated subterminal line.	In both sexes very conspicuous, not interrupted.	In both sexes very conspicuous as in *newara*, in the ♂ slightly interrupted.	In the ♂ very little conspicuous; in the ♀ interrupted, almost obsolete.
Discal ocelli.	Large, elongated along the discal veins; in the ♂ without dark line around it.	Less elongated than in *newara*, dark circle around as in *fugax* ♂.	Small circular, in the ♂ with dark circle around the spot.

The second hybrid between *Odontosia sieversi* Mén. ♂ and *Odontosia carmelita* Esp. ♀ was bred during the years 1932, 1933 and 1934 by Mr. B. von Nümers at

Dorpat, to whom I am much indebted for the following information. In the Baltic States and East Prussia both species occur together in the woods where their larvae feed on birch. It may be mentioned, however, that hybrids between these two species have never been recorded in the field. The pupae of *O. sieversi*, which species normally appears about 3 to 4 weeks earlier than *O. carmelita*, had to be kept cool, to obtain the emergence of both species together for hybridisation. The hybrid larvae were fed on birch also.

Two different forms of *O. sieversi* were used to make the crosses : (1) the nominate form *O. sieversi* Mén. in which the ♂ is of a light brown colour and the ♀ is heavily powdered with white scales; (2) a melanotic mutation ab. *stringei* Stichel (1918), in which all the wings are heavily suffused with black in both sexes and which was not recorded previous to 1916–17. It occurs localised in very few places in Lettonia; in East Prussia it is now increasing in numbers against the light nominate form *sieversi*.

The hybrid closely resembles *O. sieversi*; it has, however, in the ♂ almost dentate and ciliate antennae like those of *carmelita* ♂. The hybrid occurs in two forms, a dark and a light one according to *O. sieversi* or *O. sieversi* ab. *stringei* being a parent. The following is a comparative description of the hybrids and their two parental species :—

	Odontosia sieversi Mén.		Hybrid. *Odontosia sieversi* ♂. *carmelita* ♀.		*Odontosia carmelita* Esp.
Antennae, ♂.	Pectinate.		Very little pectinate almost dentate and ciliate; considerable variation.		Dentate and ciliate.
Antennae, ♀.	Serrate.		Intermediate.		Filiform.
Outer margin of the fore-wing.	Rounded on vein 4.		Less protruded than in *carmelita*.		Protruded on vein 4.
Scutal lobe on the inner margin of the fore-wing.	Only traces present.		Much reduced in size.		Very pronounced.
	O. sieversi.	*O. sieversi* ab. *stringei*.	Hybrid with *O. sieversi* ♂.	Hybrid with *O. sieversi* ab. *stringei* ♂.	
Ground-colour of wings.	Pale brown; in the ♀ heavily suffused with white scales.	Dark blackish brown.	Pale brown with a reddish tinge.	Blackish brown suffused with red and so becoming similar to *carmelita*.	Dark reddish brown.
Discal field of the fore-wing.	Much darker than the other parts of the wing, bordered by two faint white lines.	The same colour as the basal and marginal fields, but the two border lines pronounced white.	As in *sieversi*.	Much darker than the other parts of the wing bordered by two pronounced white lines.	Almost indistinguishable from the other parts of the wing, not bordered by light lines.
Abdomen.	Reddish-brown.	Black.	As in *sieversi*.	As in *carmelita* but not black as in ab. *stringei* !	Reddish-brown, a little darker than in *sieversi*.

The larvae of both species are very much alike but *O. carmelita* has segmental reddish-pink spots on the spiracular line which *O. sieversi* lacks. The hybrid larvae have pronounced orange yellow spots.

Cocoons of *Zerynthia rumina* (L.). By Hugh Main. With Plate I.

A number of pupae resulted from full-fed larva of *Z. rumina* found crawling over a wall near their food-plant at Praia da Rocha, S. Portugal, in May 1934. Each larva had spun a few stout silken bands between the stems adjacent to them, which had been supplied for their pupation. These bands may be considered as forming cocoons, the bracing together of the surrounding materials providing a safe refuge for the pupae from June till the following spring. Another larva put into a tube of coarse paper in a glass phial spun a horizontal cocoon towards the top of the tube. A very beautiful cocoon was spun across a longitudinal crevice in the bark of an oak tree growing near the wall. The stout strands were anastomosed in a very ingenious manner to protect the pupa within. The larvae are apparently able to adapt their methods of forming their cocoons to the very variable conditions they find in their surroundings. Plate I shows photographs of the cocoons.

Explanation of Plate 1.

Zerynthia rumina (L.).

Fig. 1. Cocoon on bark of oak tree.
2. Cocoon removed exposing pupa.
Praia da Rocha, S. Portugal. Both figures × 1.

Specimens of Yellow *Pieris napi* (L.). By Hugh Main.

Seven pupae were obtained from ova deposited by a typical specimen sent to me by my friend Mr. F. Goode from S. Devon in May 1934. When going from home in the following May the pupae were left in charge of Dr. H. D. Smart. Five of the butterflies which emerged were ordinary white specimens, but the other two were a pair of a bright yellow colour. Dr. Smart endeavoured to get the latter to pair, but unsuccessfully, so he killed and set them.

P. napi is an extremely variable insect, but yellow specimens are very rare in nature. A yellow female was caught in Donegal about 25 years ago, and from it and its descendants many beautiful yellow specimens, ab. *citronea* Frohawk, have been bred by Mr. H. W. Head, and are to be seen in many collections of British Lepidoptera. From living material supplied by Mr. Head various entomologists have bred similar specimens, and have also bred yellow specimens from their offspring.

A pair of ab. *citronea* were shown together with the S. Devon pair. It was noticeable that the latter were of a paler colour and not such a rich yellow as the ab. *citronea*.

In 1934, *Entomologist*, **67** : 138, a note by Col. C. Donovan appeared in which he said that while examining specimens of *citronea* in the Hope Collection at Oxford his suspicion of something artificial about them was aroused. He came to the conclusion that they were artificial products, obtained either by breeding experiments or by staining with picric acid. To test the latter alternative he treated white specimens of *P. napi* with a solution of picric acid in absolute alcohol, and

Cocoons of *Zerynthia rumina L.*

succeeded at once in obtaining the desired yellow colouring. He also discovered that the sulphur hue was discharged by the use of a solution of boric acid and sodium benzoate, but the normal yellow colour on the underside of the wings was not affected by this treatment.

Being interested in the experiments mentioned, I corresponded with Col. Donovan, who kindly gave me the benefit of his experience in the best methods for colouring the white specimens. I confirmed the statements that yellow specimens were successfully produced and that the original colour could be restored by the treatment which had been described. I also found that the same treatment could be used on specimens of *Pieris brassicae* and *P. rapae*, and also that the wings on one side could be stained without affecting the others. The appearance of a number of dyed specimens exhibited showed no signs of any artificial treatment. I obtained some specimens of ab. *citronea* and tested them with the solution of boric acid and sodium benzoate and found that they were unaffected by it, so could not have been stained by picric acid. I also tested one of the S. Devon specimens with the same result. On reporting the results of my experiments to Col. Donovan, he considered that they were conclusive ; he is, however, interested in an alternative treatment suggested and proposes to test it shortly.

A portion of a Birch stem from which the beetle *Melasis buprestoides* L. was emerging. By H. M. Edelsten.

My attention was first drawn to the tree from which this stem originated by the way in which the woodpeckers were working it. The wood was splitting off in short pieces and flakes, and it appeared that there were a number of transverse borings which caused the wood to split off in sections when the birds pecked it. The species which had made the transverse borings is not known. It was at first thought that the flaking off of the wood was attributable to the particular state of decay in which the tree was when first attacked by the woodpeckers, the transverse galleries becoming more apparent as the wood dried.

[The *Melasis buprestoides* was emerging from circular holes in the wood, but the transverse burrowings mentioned were wide flat galleries, varying somewhat in thickness but all very much narrower than the *Melasis* holes. They were filled with closely packed frass, so could not be cracks caused by the excessive dryness of the last summer. Eventually some cast larval skins were discovered in this frass, and proved to be those of *Melasis*, and these broad flat galleries were eventually connected with the very much wider cylindrical pupation chambers from which the beetles emerged.—K. G. Blair.]

Recorded Statements, published in 1613 and 1764, that birds were trained to catch butterflies. By Sir Edward Poulton.

My friend Major Leonard Darwin has kindly called my attention to the 1784 edition of Walton's *Compleat Angler* in which, as well as in the 1824 edition and probably others, two authorities are quoted for the statement that birds have been trained to catch butterflies. I therefore consulted the original works, and inasmuch as there are differences between the passages as given by them and in the *Compleat Angler*, the former are printed below :—

Robert Burton's *Anatomy of Melancholy*, Lond., 1676, p. 169, col. 1, records as follows :—

" The *Persian* kings hawk after Butterflies with sparrows, made to that use, and starrs; lesser Hawks for lesser games they have, and bigger for the rest, that they may produce their sport to all seasons."

A marginal note at " *Persian* " gives the reference " *S. Anthony Sherlies* relations." The statement was evidently considered appropriate for inclusion in " Memb. 4 *Exercise rectified of Body and mind*," of the " Second Partition. The cure of Melancholy." Indeed the title of the book would justify the inclusion of an immense variety of subjects and is so interesting and amusing that I venture to quote the first part of it from the 8th edition, 1676 :—" The Anatomy of Melancholy. What it is, with all the kinds causes, symptomes, prognostickes, and seuerall cures of it, in three Partitions, with their severall Sections, members & subsections. Philosophically, Medicinally, Historically, opened and cut up. By Democritus Junior. With a Satyricall Preface, ..."

In spite of the precision suggested by Burton's title, I thought it safer to consult the original work—*Sir Antony Sherley his relation of his travels into Persia*, London, 1613, and with some difficulty, for the book is without an index, found the following passage on p. 78, describing how the Persian king, after talking to the author, " called some other, who entertained him with discourses of Hunting, and Hauking, in which he is much delighted, and vseth them with great magnificence : Neuer going to any of those sports, but that he carrieth forth aboue fiue hundred dogges, and as many Hauks [*sic*], nothing rising before him but it is game. For flies he hath sparrowes; for Birds, Hobbies and Marlins; for the greatest sort some Hawke [*sic*] or other; and for Roe-deare Eagles; hee hath particular *Agaes* * for his Hawkes and Dogges, and other Officers to them a great number."

It is especially interesting to note that there is no mention of starlings.

The second quotation is from *The Life of Edward Lord Herbert of Cherbury written by himself*, 1st ed. " Strawberry-Hill : Printed in the Year MDCCLXIV." With an introductory letter by Horace Walpole. Referring to the French King Louis XIII. the original passage states on p. 133 :—

" His favorite was one Monsieur De Luynes,† who in his non-age gained much upon the King, by making Hawkes fly at all little Birds in his Gardens, and by making some of those little Birds again catch Butter-flies; and had the King used him for no other purpose, he might have been tolerated; but as, when the King came to a riper age, the government of publick Affairs was drawn chiefly from his Counsells, not a few errors were committed."

Papers.

The following papers were read :—

" The biology and distribution of *Rhizopertha dominica*," by C. Potter.

" The genus *Aptinothrips* Haliday," by E. R. Speyer.

* The *Oxford English Dictionary* gives " Agaes," in a quotation dated 1600, as the plural of " Aga " or " Agha," originally a military title but used later with a wider significance.

† My friend Mr. J. G. Edwards, M.A., has kindly informed me that De Luynes " was born in 1578 and died in 1621, and was a confidant of Louis XIII. both as king and as Dauphin. He was evidently a great practitioner of the art of falconry. There is a longish notice of him in the *Nouvelle Biographie Générale* s.n. Luynes, Charles, Duc de." The word " Nonage " is defined in the *Oxford English Dictionary* as under age or minority, and figuratively, immaturity.

" The origin of Gynandromorphs in the Lepidoptera from binucleate ova," by E. A. Cockayne.

" The times of activity of certain nocturnal insects, chiefly Lepidoptera," by C. B. Williams.

" Notes on the nomenclature of the Aculeate Hymenoptera, with special reference to the British genera and species," by O. W. Richards.

" New Trichoptera and Plecoptera from France," by M. E. Mosely.

Wednesday, 5th June, 1935.

Sir Edward Poulton, F.R.S., Honorary Life President, in the Chair.

Election of Fellows.

The following were elected Fellows of the Society :—Howard R. Binns, M.A., The Nyasaland Veterinary Service, Zomba, Nyasaland; Kenneth H. L. Key, 13, Cornwall Gardens, S.W. 7.

The Treasurer read a letter from the Home Office expressing His Majesty the King's appreciation of the Loyal Address presented on the occasion of the Silver Jubilee.

Obituary.

Sir Edward Poulton announced with deep regret the death of Mr. Robert Adkin, elected in 1885, a great benefactor of the Society, and of Mr. C. E. Stott, elected a Fellow in 1919.

Sir Edward Poulton read the following circular regarding the distribution of the agenda of General Meetings :—

The Council have had under consideration the question whether steps could be taken to improve the present arrangements for the General Meetings of the Society. It has been represented to them that Fellows of the Society would be glad to receive in advance of each meeting a printed agenda paper showing the principal communications and exhibits arranged to be made at the next meeting. In this way Fellows having special knowledge of any of the matters proposed to be communicated to the Society at that meeting, or of the exhibits proposed to be shown thereat, would be able to come to the meeting prepared to take part in the discussion. It is felt also that the issue of agenda papers would be welcomed by Fellows resident abroad and by those Fellows who live at a distance from London, as it would enable them to keep in closer touch with the activities of the Society than is possible under the present arrangement by which the only intimation which they receive of these activities is that contained in the *Proceedings*, issued at intervals of six months.

Under a scheme of this kind it would, moreover, be possible to arrange more frequently for the greater part of a particular General Meeting to be devoted to a discussion of some problem of general interest to entomologists.

The Council have accordingly decided that there shall be circulated to every Fellow of the Society not later than the Saturday preceding the General Meeting on Wednesday, 2nd October, 1935, and on the Saturday preceding every subsequent General Meeting a notice containing particulars of communications and exhibits

proposed to be made at that meeting, together with the draft of the minutes of the last previous General Meeting.

It will be necessary for Fellows, who propose to make communications or exhibits at General Meetings and who desire that a note of these should be included in the agenda to be issued before the meeting, to notify the Secretary of the proposed communication and exhibits not later than fourteen days prior to the date of the meeting. Where possible, these notifications should be accompanied by an abstract not exceeding 150 words of the purpose of the communication or exhibit.

It is hoped that Fellows will co-operate by sending such notifications to the Secretary in order that the agenda to be distributed may be as complete as possible. It is not proposed, however, to alter the existing arrangement by which Fellows may also make communications to, and exhibits at, General Meetings, on signifying to the Secretary their intention of so doing before 12 noon on the day of the meeting concerned, though priority will be given at the General Meetings to communications and exhibits the titles of which have been included in the agenda circulated before the meeting.

It has further been decided that all Fellows who propose to make exhibits at the General Meetings shall in future place their exhibits on view not later than 7 p.m. on the day of the meeting.

By order of the Council,
A. W. McKenny Hughes,
Hon. Secretary.

Exhibits.

The following communications were made to the meeting :—

Inquiline Tineid larva in Termitaria, Nyasaland. By Sir Edward Poulton.

It is a great pleasure to be able to show these interesting larvae together with one of the moths and the termites, recently sent from Fort Johnston, Nyasaland, by my friend Dr. W. A. Lamborn whose description of the behaviour of the inquilines and their hosts is recorded in our *Proceedings* for February 6, 1935 (p. 3). One of the larvae was sent to Mr. Edward Meyrick, F.R.S., who wrote on June 4th : " The larva arrived this morning, and I have examined it and taken a description; it is unquestionably very curious, and I have seen nothing like it. I anticipate however that it will be found to belong to true Tineidae."

I hope to receive Mr. Meyrick's description of the moth and larvae and Dr. Eltringham's account of the larval minute structure, together with the determination of the termite, so that they may be added as post-dated sections of this communication.

[Mr. Meyrick wrote 9 June, 1935—" I find the insect to be a new genus of Tineidae, and accordingly have made the requisite descriptions, which I enclose. I set out one half of the specimen, which was necessary to enable me to see the neuration; if I had set out the other half, it would not have gone into the tube. I leave the recording of all other particulars to you. Undoubtedly the larval structure is most curious, but the high degree of specialisation in this stage is not reflected in the imago." Mr. Meyrick's description is printed below, followed by Dr. Eltringham's and this by Mr. N. D. Riley's letter with Mr. McKenny Hughes' determination of the termite.—E. B. P. 26 Aug. 1935.]

Description of a Tineid moth and its inquiline larva.

By Edward Meyrick, F.R.S.

Passalactis gen. n. (Tineidae).

Head with long rough hairs; ocelli posterior; tongue absent. Antennae $\frac{5}{6}$, ♂ simple, filiform, joints closely set, scape moderate, without pecten. Labial palpi moderate, porrect, second joint with elongate apical tuft of scales, terminal joint loosely scaled, shorter than tuft, lying on it. Maxillary palpi very short, slender, filiform, deflexed. Hind tibiae hairy (defective). Fore-wings 2 from $\frac{4}{5}$, 3 from angle, 7 to costa, 8 absent, 11 from towards base. Hind-wings nearly 1, elongate-ovate, cilia $\frac{4}{5}$; 2 from $\frac{3}{4}$, 3 from angle, 3–7 nearly parallel.

Related generally to *Tinea*, but separable by the reduced maxillary palpi, long tuft of labial, and absence of vein 8 of fore-wings. Genotype *P. tentatrix* sp. n.

Passalactis tentatrix sp. n.

♂. 14 mm. Head pale yellow-ochreous. Palpi light yellow-ochreous, mixed blackish except tuft. Antennae pale ochreous. Thorax yellowish-grey irrorated blackish. Fore-wings elongate, costa moderately arched, apex obtuse, termen very obliquely rounded; grey-yellowish, coarsely and densely irrorated blackish; markings golden-yellow; subcostal and dorsal streaks from base to an irregular oblique transverse streak about $\frac{1}{4}$, from dorsal end of this a bar of irregular marbling to middle of a very irregular narrow fascia from middle of costa to tornus, an irregular spot on dorsum between these; three small spots grouped together on costa towards apex, and two similarly on termen beneath apex: cilia yellow, barred blackish irroration. Hind-wings dark grey; cilia light grey.

Larva length 14 mm., width 1·8 mm., cylindrical, slightly tapering towards extremities; whitish, whole surface forming very numerous pubescent papillae; head and thoracic shield testaceous; legs strong, with simple acute claws; segments 5–11 each with a pair of long stout tapering testaceous horny tubercular processes (length about 1 mm.) rising obliquely upwards from sides, set with scattered minute hairs, apex of process rounded, whitish, a larger area at base of process posteriorly also whitish; preanal and anal plates testaceous; prolegs normal, short, with nearly complete circles of minute hooks, anal pair very short, circlet more widely incomplete.

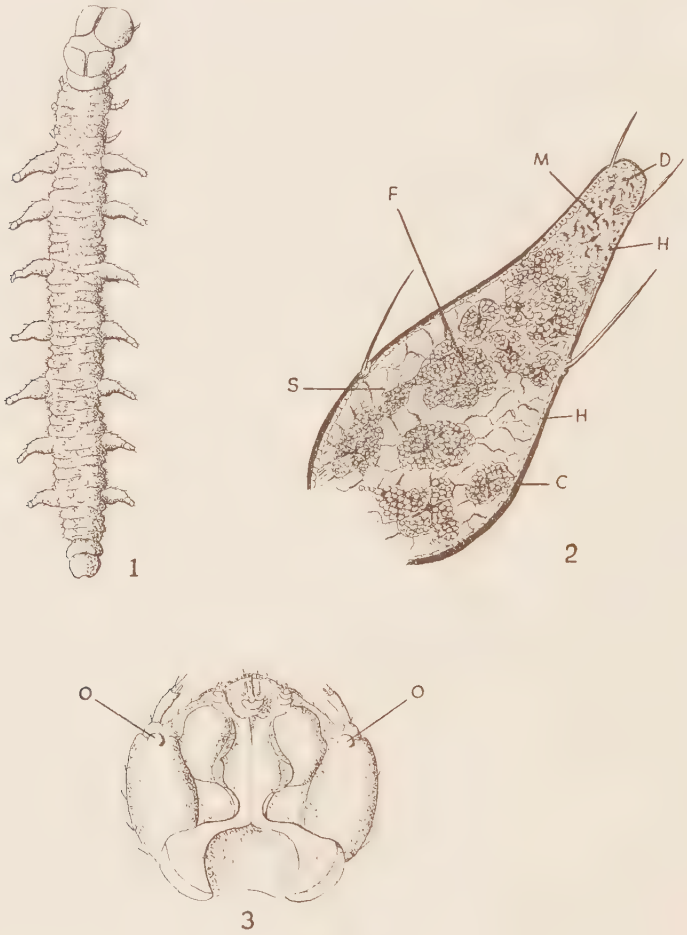
The tubercular processes of this curious larva are unique in my experience.—E. M.

On the Larva of Passalactis tentatrix *Meyr.* (Tineidae).

By H. Eltringham, D.Sc., F.R.S.

Sir Edward Poulton has handed me examples of the inquiline larva described above. Dr. Lamborn, who discovered it in Termitaria, states that the termites appear to extract some attractive and edible substance from the tubercles, of which there are seven on each side. It seemed therefore that a histological examination of these appendages might disclose a glandular structure of some interest. Sections were made in the usual way and various stains used, the most effective being iron–haematoxylin. Fig. 1 shows an enlarged view of the larva, which is actually about 1·0 cm. long. The general surface is rugose, scattered with very small projections, and sparsely covered with minute setae. The large lateral tubercles are moderately chitinised except at the distal extremities, where the cuticle becomes exceedingly thin. Sections of the larva show no unusual structures in the body cavity, but the lateral tubercles show a complicated structure which I have endeavoured to illustrate in fig. 2. The chitinous cuticle C becomes very

thin distally, but on the other hand the hypoderm H which is poorly developed under the thicker chitin becomes thicker at the distal end, and the comparatively large granulated nuclei are more conspicuous. In surface view this distal hypoderm shows a reticulated structure. The greater part of the interior of the tubercle consists of a laminated, spongy, slightly chitinised supporting tissue S, the large interstices of which are occupied by a mass of tissue indistinguishable from ordinary fat-body F. At the distal extremity of the tubercle there is a mass of material



Figs. 1–3.

M, which presents considerable difficulty of interpretation. It is here that we should expect something of a glandular nature, but the tissue is far from glandular in appearance, cell-walls are not clearly visible, the appearance being merely that of a fine granulated mass. It should be noted that the larvae were fixed in Carnoy's fluid, which is favourable to chromatin staining, but an unsatisfactory fixative for general cell structure. Whether due to this or not, there is no cell structure visible, but the granular mass contains darkly staining bodies D, of a peculiar form. They are either spindle- or comma-shaped, and when of the former type,

may in some instances be greatly elongated so as to resemble, at least in shape, the familiar "bipolar" nerve-cell, though I do not think they are of a nervous character. It would be interesting to observe, under a stereoscopic microscope, the action of the termite in contact with these tubercles. The actual excretion of a supposed fluid might then be determined. The highly developed hypoderm, and tenuity of the cuticle, seem to suggest the possibility of an excretion of some kind, but there is certainly no typical glandular structure. Finally one other point seems worthy of record. I have studied very few "micro" larvae, and cannot find any reliable description. Lepidopterous larvae usually have six ocelli on each side of the head. The present species has only one relatively large ocellus,* and that is placed rather ventrally, close to the base of the antenna. Fig. 3 is a sketch of the underside of the head, and the ocellus is indicated at O.—H. E.

Determination of the Termite host of the inquiline larva of Passalactis tentatrix *Meyr.*

By A. W. McKenny-Hughes, D.I.C.

[Mr. N. D. Riley kindly wrote, 26 June, 1935 :—]

"The termite has proved easier than we anticipated. McKenny-Hughes with a little help has been able to run it down to *Rhinotermes* (*Schedorhinotermes*) *lamanianus* Sjöst. He tells me that this is a very characteristic genus with only one or two African species in it, and so he is perfectly satisfied that the identification is correct."

Five female Fossorial Wasps (*Trypoxylon lissonotum* Cam.) from compartments in the glass tube of a fountain-pen-filler : 1933–34, Tzaneen, N. Transvaal. By Botha de Meillon, South African Institute for Medical Research.

[Communicated by Sir Edward Poulton, who exhibited the wasps and said that they had been kindly determined by Dr. G. Arnold, D.Sc.]

Notes on the larval food, cocoon-spinning and emergence of five female Trypoxylon lissonotum *Cam.*

7.xii.33. Found in a rack the glass portion of a fountain-pen-filler. The tube was divided off into five compartments by means of thin mud septa. Each compartment contained some spiders. One spider in each compartment had a very small white glistening grub attached to it.

Nearest to the drawn-out end through which the parent wasp could not have entered,

Compartment A contained 4 large and 1 small spiders.
,, B ,, 4 large spiders.
,, C ,, 4 ,, ,,
,, D ,, 6 smallish spiders.
,, E ,, 4 spiders.

* Mr. Meyrick has kindly written, 5 Aug. 1935, as follows :—"Tillyard, in his *Insects of Australia and New Zealand*, p. 406, after writing 'the typical Lepidopterous caterpillar has six ommatidia' [as he calls them, holding that they are distinct from ocelli] 'on each side of the head,' adds, 'The larvae of Gracilariidae and some Tineidae have only one pair.'"

It is obvious that the parent wasp must have entered from the open end E and that the egg in A was laid first, and would therefore be older than eggs in B, C, D, and E. One would thus expect it to hatch first; if so it will have to break through five mud partitions in order to emerge! This seems unlike Nature. If A contained most food the insect would take longer to mature, but the food appears to be evenly distributed amongst the compartments!

8.xii.33. Larva in A quite evidently more mature than others; larva in E least mature (judging by size).

11.xii.33.

Compartment A. Spiders finished, larva in whitish cocoon; still spinning.
,, B. ,, ,, ,, ,, ,, ,,
,, C. ,, ,, ,, ,, ,, ,,
,, D. ,, ,, ,, just beginning to spin.
,, E. One complete spider and remnants of another one still left.

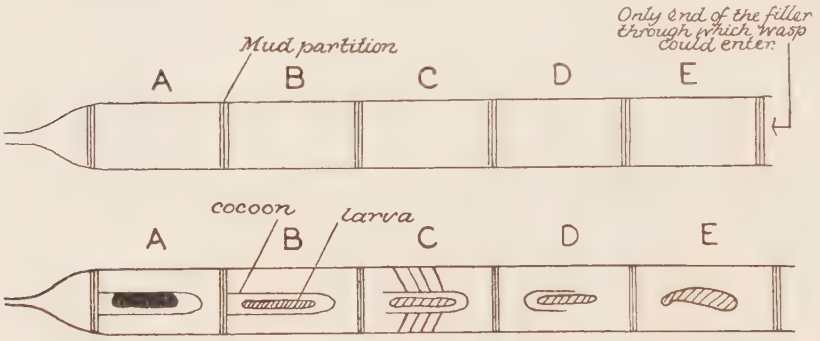


Fig. 1.

12.xii.33.

Compartment A. Cocoon finished, open end attached to lower mud partition.
,, B. ,, ,, ,, ,, ,,
,, C. ,, ,, and attached to side of tube by threads.
,, D. Cocoon half finished.
,, E. Spiders just finished, larva beginning to spin.

15.xii.33. Cocoons all completed.

5.i.34. At 3.30 p.m. adult in B has eaten its way through cocoon and at short intervals tries to break through barrier of mud between it and C.

6.i.34. Adult in B has made no further progress.
,, A out of cocoon making progress through to B.

7.i.34. Adult in E with its head through partition leading to opening of tube.
Adult in D breaking through partition towards E.
,, C ,, ,, ,, ,, D.
,, B has made no further progress.
,, A ,, ,, ,,

8.i.34. Adults from B, C, D, and E have made their way completely out of the filler into a larger tube within which the filler had been placed.

9.i.34. A still trying to get out.

10.i.34. All adults dead except in compartment A. This insect now faced in

opposite direction nibbling away at the partition at narrow end of tube from which there is no possible escape. Dies.

As was suspected A and B hatched first; A never succeeded in advancing beyond its own compartment; B only escaped after C, D and E had already broken through their barriers. It seems obvious that no provision was made for the youngest larva to hatch first, which is really necessary if the oldest is to be given a chance of surviving. Possibly the filler is an unnatural habitat for this wasp, and in nature some other provision is made for the survival of the first born.—B. DE M.

[It would be very interesting to know whether the emergences from the tube on January 7 and 8 were strictly in the sequence E, D, C, B, or whether one or more of the wasps passed through chambers containing others that were emerging. If this was not so the four emergences must have been in the inverse order of age—the youngest first, the oldest last. It is much to be hoped that further observation will be directed to this special point, for it is of great interest and may throw much light upon the behaviour of certain species in the wild state. The pause of A and B when they had emerged from their cocoons suggests the possibility of some inhibitory effect exerted by the wasps in one or more of the chambers E, D, C. It is obvious, however, that the instinctive behaviour of A was abnormal.—E. B. P.]

"Mosquito bites" believed by the Somali natives to be the cause of "deadly fevers," as reported by Sir Richard Burton in 1856. By Sir EDWARD POULTON.

My friend Mr. A. H. Hamm has sent me a copy of a very interesting passage in a footnote to pp. 23–4 of *First Footsteps in East Africa or an Exploration of Harar*, by Richard F. Burton, London, 1856.

"'Fid-mer,' or the evening flyer, is the Somali name for a bat. These little animals are not disturbed in houses, because they keep off flies and mosquitoes, the plagues of the Somali country. Flies abound in the very jungles wherever cows have been, and settle in swarms upon the traveller. Before the monsoon their bite is painful, especially that of the small green species; and there is a red variety called 'Diksi as,' whose venom, according to the people, causes them to vomit. The latter abounds in Gulays and the hill ranges of the Berberah country: it is innocuous during the cold season. The mosquito bites bring on, according to the same authority, deadly fevers: the superstition probably arises from the fact that mosquitoes and fevers become formidable about the same time."

Mr. Hamm's copy was made from a volume in the "Everyman's Library" series which accurately follows the passage in the original edition. The period of the author's journey was Oct. 1854 to Feb. 1855 and the preface is dated 10 Feb., 1856. Major Austen, to whom I showed the passage, agreed that so early a recognition of the cause of malaria was well worth attention, for it does not appear to be noticed in works devoted to the subject. The fact that the natives were right and the author mistaken in his interpretation is also of much interest.

***Vermileo vermileo nigriventris* Strobl (RHAGIONIDAE) bred from hibernating larvae collected by Mr. Hugh Main in S. Portugal.** By Sir EDWARD POULTON.

The two living female Diptera exhibited to the meeting emerged on the 1st and 3rd of June, 1935, respectively. Of the larvae collected in June 1934, some

pupated and emerged in August at St. Helens, I.W., while the remaining six were, on returning to Oxford, left in the Hope Department, in the charge of Mr. Ernest Taylor, who supplied them with ants (*Myrmica*) and small woodlice (*Tricloniscus roseus* Koch). Two pupated on the surface of the sand, 2nd May, 1935, while the remainder ceased to feed and to make pits, and had all pupated, also on the surface, by May 12. Four emerged, including the exhibited specimens, between May 25 and June 3.

I am greatly indebted to my friend Mr. Hugh Main for giving me the opportunity of observing these most interesting " Demons of the Dust " and also for the pleasure given to many friends who saw them.

" Worm-lions " from Portugal and the Sudan (Diptera, RHAGIONIDAE), with a description of a new species. By F. W. EDWARDS, Sc.D.

During a visit to South Portugal in 1934 Mr. Hugh Main obtained a number of " worm-lions " (*Vermileo* sp.) from which flies were reared which appeared to show marked differences from the common *Vermileo vermileo* L. As the recent revisions by Lindner and Szilady of the Palaearctic RHAGIONIDAE mention only a single species of *Vermileo*, it was thought at first that these Portuguese specimens must represent an undescribed species, but Wheeler in his *Demons of the Dust* mentions a subspecies *nigriventris* described by Strobl (1906, *Mem. Soc. esp. Hist. nat.*, **3** : 271) which has been overlooked by recent revisers. Reference to Strobl's description shows that the Portuguese specimens must belong to this subspecies, the types of which came from Cercadilla and Los Molinos, Spain. Strobl knew only the male of his subspecies, but the series reared by Mr. Main includes several examples of each sex, and it is therefore now possible to give a fuller statement of the distinctions between the two forms than Strobl was able to do.

Some years ago I received from Mr. H. Britten of the Manchester Museum specimens of a *Vermileo* reared from larvae collected by Mr. R. A. Wardle in the Sudan. These were put aside for future study as being possibly distinct from *V. vermileo*; the opportunity has now been taken of examining them in detail, and they prove to belong to a new species which is described below. Perhaps the record of *V. vermileo* from Egypt may refer to this new species rather than to the true *V. vermileo*.

The genus *Vermileo* has usually been referred to the RHAGIONIDAE (LEPTIDAE), but the correctness of this allocation has recently been questioned by G. C. Crampton, who regards the thoracic structure as indicating a closer affinity with the ASILIDAE. Comparison of the male hypopygial structure of *Vermileo* with that of typical RHAGIONIDAE and ASILIDAE suggests that the older view is more likely to be correct; the form of the ninth sternite, with its inwardly-articulating styles, is quite similar in *Vermileo* and *Chrysopilus*.

Vermileo vermileo vermileo L.

Examples of *V. vermileo* in the British Museum from the South of France and Spain show the following features of colouring :—

(1) Third antennal segment mostly yellowish, darkened on upper edge only.
(2) Palpi yellow.
(3) Pronotum yellow.

(4) Middle dark stripe of mesonotum divided by a pale area except in front and not reaching back beyond middle of thorax.

(5) Scutellum yellowish.

(6) Dark area in middle of pleurae not extending on to pteropleura.

(7) Hypopleura yellowish.

(8) Hind coxa with a dark patch behind, fore and mid coxae wholly yellowish.

(9) Hind femora and tibiae indefinitely darkened towards tips.

(10) Wings practically clear.

(11) Abdomen largely yellow; in ♀ with median and lateral dark spots on each tergite; in ♂ with these spots larger and fused into dark bands on each of tergites 2–4, but leaving the anterior and posterior margins of these tergites, as well as most of tergites 5–7 yellow.

Vermileo vermileo nigriventris Strobl.

Mr. Main's specimens from Praia de Rocha, South Portugal, show the following differences in colouring from typical *V. vermileo* as described above :—

(1) Third antennal segment all dark.

(2) Palpi blackish.

(3) Pronotum dark.

(4) Middle dark stripe undivided and (except in some ♀♀) reaching back to scutellum.

(5) Scutellum blackish, at least in ♂.

(6) Dark area in middle of pleurae extending on to pteropleura.

(7) Hypopleura largely dark.

(8) Hind coxae blackish, other coxae also largely darkened.

(9) Hind femora and tibiae blackish on at least the distal two-thirds.

(10) Wings with a small smoky area towards outer end of upper basal cell.

(11) Abdomen mainly black; in ♂ and in darker ♀♀ with only the bases of segments 3–6 yellow, 2 and 7–9 entirely black; in lighter ♀♀ also with posterior margins of segments 2–7 yellowish.

Mounts of the male hypopygia of the two forms show no obvious differences, and in other parts of the body there appear to be no constant structural distinctions between the two forms. All the specimens of typical *V. vermileo* which I have examined have the fourth posterior cell of the wing rather widely open, while most of those of the subspecies *nigriventris* have this cell closed or only narrowly open, but the venation in this genus is so subject to variation that no importance can be attached to such differences. A peculiarity of some of Mr. Main's specimens is that the second posterior cell is pointed at the base or even stalked, but in others it is broadly sessile as usual.

V. v. nigriventris is clearly not the same as *V. v. balearicus* Wheeler from Majorca; the description of the latter does not indicate any well-marked distinction from *V. v. vermileo* L.

Mr. Main has sent the following account of the eggs and young larvae, which were not previously known in the case of the European species; as he remarks, there is a rather marked difference from the egg-laying habits of the American species described by Wheeler.

" Male and female *Vermileo* on emergence were put into a cage with fine dust, half the surface of the interior being covered with black paper. No pairing was observed, but a female was noticed running about with the abdomen curved abruptly forward and an egg carried at the tip of the tail. Oviposition was not observed, but a large number of ova must have been laid in the dust as many small pits appeared, made by the newly-hatched larvae.

" Three ova were laid on the black paper, these being creamy-white in colour with a smooth but dull surface, about 0·6 by 0·4 mm., set at an angle of about 45° with the surface and in two out of three cases with the micropylar end upwards. The shell is hard and remains rigid after the hatching of the larvae; emergence was by irregular slits close to the micropylar end at one side.

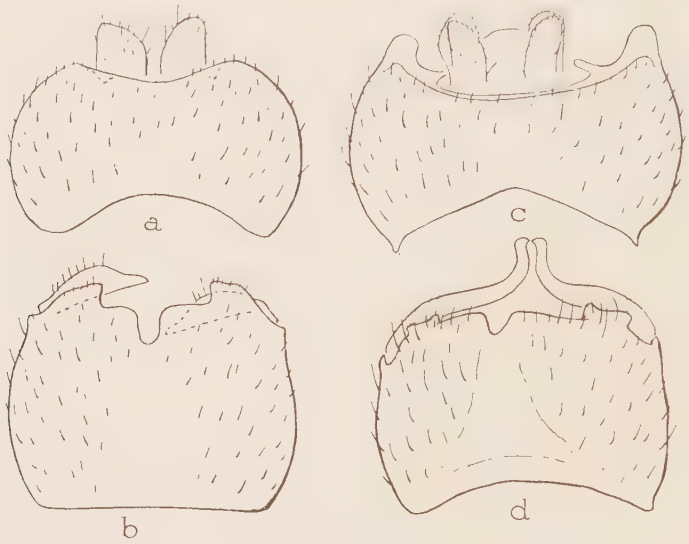


Fig. 1.—Hypopygium of *Vermileo vermileo* L. (*a*, *b*) and *V. niloticus* sp. n. (*c*, *d*) from above (*a*, *c*) and below (*b*, *d*). Aedeagus (phallosome) omitted.

" The young larvae as soon as hatched would jump actively when stimulated. It was difficult to get small enough insects to feed them, but small specimens of *Lasius flavus* were seized, especially if they had been previously stunned by rubbing gently between the finger and thumb.

" Twelve months after hatching the larvae had only moulted once. Their pits were then about ½ inch in diameter at the top, but they could still only overpower quite small ants."

Vermileo niloticus sp. n.

In general very similar to *V. vermileo*, but showing many small differences. Palpi yellow, but shorter than in *V. vermileo*; third antennal segment also shorter. Face slightly narrowed below, which is not the case in *V. vermileo*. Pronotum yellow. Middle dark stripe of mesonotum undivided, but not reaching back to scutellum. Scutellum blackish; a large blackish patch in middle of pleurae, which, however, does not extend on to pteropleura; hypopleura dark. Hind coxae all dark; hind femora and tibiae not very dark. Abdomen with yellowish ground-colour; tergites 2–6 each with large but ill-defined dark dorsal spots,

and with less obvious dark lateral spots; 7 all dark. Hypopygium differing considerably from that of *V. vermileo*: ninth tergite broader, with its corners produced into bare, rounded processes; style much more slender, twisted and bare; posterior margin of sternite different in outline.

Sudan (locality unrecorded), larvae collected in Oct. 1925 (*R. A. Wardle*), 2 ♂♂ reared in Manchester in March 1927 (*H. Britten*).

A living specimen of the Dynastine beetle *Strategus titanicus* F. imported in bananas. By Professor G. D. Hale Carpenter.

This beetle was brought to the Oxford Museum, having been found in bananas. It was identified by Mr. Arrow, who kindly told me that specimens were commonly brought over in this manner. All the specimens that he had seen were males, as in the case of this specimen.

A new *Bematistes-Pseudacraea* combination from Uganda. By Professor G. D. Hale Carpenter.

Mr. T. H. E. Jackson, F.R.E.S., collected in September 1932 in the Budongo forest, Bunyoro, Western Uganda, certain interesting butterflies such as the little known *Bematistes schubotzi* Grunb. (1934, *Proc. R. ent. Soc. Lond.*, **8**: 109).

I urged him, if possible, to return and make a large collection of species of *Bematistes* and their associates, which he was fortunately able to do in August–September 1934, the results being of much value in the study of geographical distribution of models and mimics. It appears that, at the time and in the place where he collected, *Bematistes tellus eumelis* Jord., which in my experience is generally the most abundant of the species of *Bematistes* with which mimetic forms of *Pseudacraea* are associated, was replaced by *B. schubotzi*, usually considered to be a rarity. The female of this differs from *tellus* conspicuously on the upper surface by the brilliantly shining white subapical patch of the fore-wing which in *tellus* is of the same dark orange-brown colour as the hind-wing. Moreover the inner-marginal patch of the fore-wing in most specimens is also shining white, although occasional specimens show it to have orange suffusion. This seems to be more highly developed in the Budongo specimens than in those collected west of Lake Kivu by T. A. Barns (vide infra): out of six females sent to the Hope Department in two the inner marginal patch is of the same colour as the hind-wing except for a very slight white suffusion anteriorly where it meets the black, in two others the pale portion of area 1 *b* is more orange than white, 1 *a* being orange and 2 being more white than orange, while the remaining two show decided suffusion with orange scales at the bases of the white areas. In Barns specimens only one has the white inner marginal patch partially suffused with orange. Possibly the Budongo specimens may prove to be a distinct race. The male *schubotzi* has the subapical patch white on the under surface only.

This striking *Bematistes* was by no means uncommon in the Budongo forest, for Mr. Jackson captured nineteen, whereas only three *tellus* were taken, one having the subapical area of the fore-wing so suffused with white that it was thought to be *schubotzi* at first. A form of *Pseudacraea eurytus* female was taken which bears as close a resemblance to *schubotzi* as the form *terra* Neave does to *tellus eumelis* in most parts of Uganda: the resemblance is to those *schubotzi* in which the inner

marginal area of the fore-wing is not entirely white. But the shining white subapical patch, and the rich golden orange ground-colour very closely resemble the corresponding parts in *schubotzi*. This form of *eurytus* appears not to have been described: there are none at Tring, and the very large collections of *eurytus* at Oxford contain no specimen. The collection formed by the late Mr. J. J. Joicey contains two females of this type taken by the late T. A. Barns in the same locality in which he found *schubotzi* plentiful (vide infra): these are now in the National Collection. The data are as follows: Upper Lowa Valley North Side, Sept. 1921, and Itoa river, Ituri forest, Congo Seniliki [*sic*] watershed, Congo-Belge, Jan. 1920.

There is also a specimen in the Hope Department with data "Fernando Po, between Moka and Concepcion, 2000–3000 ft., G. H. Bullock, Dec. 2, 1915," an area in which *schubotzi* has not yet been recorded.

This form is now described as follows:—

Pseudacraea eurytus ♀ form **schubotzoides** f. n.

Pattern as in *terra* Neave. The orange-brown ground-colour is of a richer, deeper, golden orange than in *terra*, like that of *Bematistes schubotzi* Grunb., but the subapical area on both sides of the fore-wing is clear shining white with no yellow scales. The under surface of the base of the hind-wing shows a faint trace of darker red-brown shading, more than in typical *terra* but not so much as in examples of *terra* from the Sese Isles, L. Victoria, transitional to *tirikensis* Neave, in which there is often a distinct red basal triangle. Such transitional specimens may have the subapical yellow area suffused with white scales but not of the pure shining white of *schubotzoides* (1913, *Trans. ent. Soc. Lond.*, **1913**: Pl. XXXIV, fig. 10).

Type and paratype in the Department of Entomology, Oxford University Museum, from Budongo forest, Bunyoro, W. Uganda, August–September 1934 (*T. H. E. Jackson*).

The males associated with this form have the subapical area of the fore-wing only slightly paler than the other areas, thus resembling on the upperside the male *schubotzi*, but it is not white underneath as in *schubotzi*. The male form is not sufficiently distinct from *terra* to be clearly separated: it has also been taken at Yambio, Bahr-el-Ghazal, S.W. Sudan.

There are also to be included in the associates of *schubotzi* in the Budongo forest the similarly coloured form of *Acraea althoffi* recently described as f. *budongensis* (1935, *Proc. R. ent. Soc. Lond.*, **10**: 22) and a corresponding form of *A. jodutta*. The latter, alluded to by Eltringham (1912, *Trans. ent. Soc. Lond.*, **1912**: 329) as a form of *dorotheae* E. Sh. with the subapical area white, was named ab. *integra* by Schultze and Aurivillius (1923, *Ergebn. 2te. Deuts. Zentr. Afr. Exped.*, 1910–11, **1** (17): 1121), the type having come from South Cameroon. It is widely spread, and the corresponding form in the closely allied, more southern, *A. esebria* Hew. has a considerable resemblance to *D. chrysippus* L.; an interesting example of the linkage of groups centring round different models. *A. jodutta* frequenting forest or bush would only occasionally encounter *chrysippus* in the forest, but in the open would benefit by the resemblance, while in the forest it would gain by resemblance to *schubotzi*, or as the form *dorotheae*, to *tellus*.

The discovery of areas in the Eastern Congo and Western Uganda where *Bematistes schubotzi* exists in abundance, and has associated with it hitherto unknown forms

Photo: Imperial Forestry Institute, Oxford.

Species of *Planema* and associated mimics from Budongo Forest, Uganda. Slightly less than three-fifths natural size.

of *Acraea althoffi* and *Pseudacraea eurytus* adds another pair to the now well-known *Bematistes-Pseudacraea eurytus* series. (References to previous work in Uganda will be found in my last paper on this subject (1924, *Trans. ent. Soc. Lond.*, **1923**: 469, 491).)

The Joicey collection contains a fine series of *schubotzi* (15 ♂♂, 14 ♀♀) obtained by T. A. Barns to the west of Lake Kivu, in an area bounded by the parallels of 28° and 30° E., the Equator, and 2° N. There is also one ♀ specimen from northern Ruanda, on the east of the rift valley, between Lake Kivu and Lake Tanganyika. Neave took one specimen only during his visit to the Budongo forest in 1911.

I take this opportunity of alluding to the vigorous criticisms of the interpretation of these phenomena by Natural Selection which pour from the pen of Herr Franz Heikertinger of Vienna. This critic accuses those who support this interpretation of inventing some mysterious special explanation for phenomena which are no more than coincidental likenesses among insects which, with only a limited number of colours and patterns available, must present a fortuitous resemblance to each other sometimes, more especially as they have a common ancestry.

Such arguments ignore the niceties of geographical distribution such as I showed in the associations from islands in Lake Victoria, which may exhibit the forms of *eurytus* in different proportions on two islands closely adjacent, the forms on each island agreeing with the appearance of the predominant *Bematistes* on that island. Budongo forest adds one more area to those already described in which the predominant *Bematistes* is associated with forms of *eurytus* like itself in appearance and numbers, while other forms of *eurytus*, resembling less numerous *Bematistes* are in the minority. A full account of Mr. Jackson's whole collection of these mimetic associations in Budongo forest will, it is hoped, be available at a later date.

Explanation of Plate 2.

Two mimetic associations centring round *Bematistes schubotzi* Grunb. and a form of *B. epaea* Cr. collected by T. H. E. Jackson, August–September 1934, in Budongo forest, Bunyoro, Western Uganda.

Fig. 1. *Bematistes schubotzi* Grunb., ♀.
2. *Pseudacraea eurytus schubotzoides*, ♀, form. n. Type.
3. *Acraea jodutta integra*, ♀, Schultze and Auriv.
4. *Acraea althoffi*, ♀ form *budongensis* Carptr. Type.
The subapical patch of the fore-wing brilliant white, the other pale areas rich golden orange.
5. *Bematistes epaea*, ♀. Intermediate between *e. epaea* Cr. and *e. paragea* Gr.-Sm.
6. *Pseudacraea eurytus*, ♀. Form transitional to *obscura* Neave, mimicking 5.
7. *Bematistes epaea*, ♀. A little nearer to *paragea* than 5.
8. *Papilio cynorta*, ♀ f. *peculiaris* Neave, mimicking 7. In these two the cream colour of the hind-wing is more definitely restricted than in 5 and 6.
These four specimens agree in the cream colour of the pale areas.

The effect of the severe frost of 17th May on oak-feeding larvae. By Mr. H. M. Edelsten.

Ten degrees of frost were registered on the high ground and as much as fifteen degrees in the valleys on 17th May, 1935. The foliage of oak, ash and beech was completely destroyed and as the result of the hot sun next day became hard and brittle. Many trees were carefully examined a week afterwards to see how the larvae had been affected. There were still numerous larvae alive (chiefly Tortricids), but they

were showing signs of starvation. Possibly the dew and rain softened the leaf-stems and enabled them to exist. After a fortnight the same trees were again examined and I noticed that the new shoots were being gnawed by the larvae which had survived. Many general feeders had left the oaks and were feeding on hazel, alder and birch growing beneath the oaks. A larva of *Thecla quercus* (L.) was found feeding on honeysuckle, but returned to oak immediately it was offered to it. The oak foliage exhibited was kept in a tin box for 14 days and on examination five larvae (all Tortricids) were still alive and were strong enough to eat oak leaves when offered them. It is to be feared, however, that a great number of larvae perished.

Wednesday, 2nd October, 1935.

Dr. S. A. Neave, O.B.E., President, in the Chair.

Elections.

The following were elected Fellows of the Society :—C. J. Golledge, 8, Dryden Mansions, Queen's Club Gardens, London, W.14; M. S. Mani, Entomological Section, Zoological Survey of India, Indian Museum, Calcutta, India; and Geoffrey R. Walker, M.B., Ch.B., D.T.M., The Sir Alfred Jones Research Laboratory, Freetown, Sierra Leone, West Africa.

Obituary.

The President announced the deaths of Dr. Paul Martin, elected in 1935, W. Ormiston, elected in 1913, and of A. H. Swinton, elected in 1876, who, at the time of his death, was the senior Fellow of the Society.

Papers.

The following papers were read :—

" The Mutillid Wasps of the Islands of the Pacific Ocean," by Professor C. E. Mickel, Ph.D.

" The Rhopalocera of Abyssinia," by Professor G. D. Hale Carpenter, M.B.E.

Exhibits.

The melitaeine butterflies *Euphydryas wolfensbergeri* Frey and *E. desfontainii* Godt. with remarks on their geographical distribution. By Dr. L. G. Higgins.

E. wolfensbergeri Frey is quite distinct from *E. maturna* L., with which it is often associated in modern text books. It is identical with *E. intermedia* Men., which occurs in the Altai, Sajan and Kentei ranges and extends eastwards into Corea. *E. wolfensbergeri* therefore provides very striking evidence of the relation between the Alps and the great mountain ranges of Northern Asia. The nearest European habitat is separated from the Altai Mountains by over 3,000 miles, but specimens from these localities are not distinguishable. With the possible exception of *Parnassius phoebus* F., it is probable that no other butterfly is known at present which shows a similar distribution.

E. desfontainii Godt., is a well-known insect inhabiting Spain and North Africa. It is related very closely to the form *orientalis* H.S., from Asia Minor, indeed in some cases the resemblance is so close that if a specimen of *orientalis* were taken in Spain the fact would possibly pass unnoticed. The genitalia of the two forms show small but obvious differences and it is reasonable to look upon them as specifically distinct. It is certainly true to say that *orientalis* represents *desfontainii* in Asia Minor, and it is suggested that the taxonomic position would be better expressed if the two butterflies were united as subspecific forms of a single taxonomic unit. In this way the close relationship would be emphasised and the species would naturally take its proper position with several others exhibiting a similar distribution.

Geographical races of British Humble bees. By Dr. O. W. Richards.

An account of the races of *Bombus muscorum* (L.) and *B. smithianus* White has recently been published (Richards, 1935, *Trans. Soc. Brit. Ent.*, **2** : 73–85, 1 pl.). The former species (subsp. *sladeni* Vogt) is widespread but local in south England, including Lundy Isle; in Scotland and Ireland it becomes commoner in a slightly different form (subsp. *pallidus* Evans). It reaches the Orkneys where it is again a little differentiated (subsp. *orcadensis* Richards). *B. smithianus* is known from the Shetlands, Outer Hebrides, Tiree and Coll (subsp. *smithianus*), Aran Is. (subsp. *allenellus* Stelfox), Scilly Is. (subsp. *scyllonius* Richards) and Alderney. This fringing distribution has many analogies with that of the voles (*Microtus* and *Evotomys*). In them there is some evidence that a Pleistocene fauna has been driven outwards by recent invaders.

Bombus jonellus (Kirby), of which the variation was described by Richards (1933, *Ann. Mag. nat. Hist.*, (10) **12** : 59–66), is also spread over the British Isles, but races are developed only on Shetland (subsp. *vogtii* Richards) and Outer Hebrides (subsp. *hebridensis* Wild). In this case, the races appear to be forms split off an ancient member of our fauna, rather than the relics of the Pleistocene.

***Catopsilia* pairing in the air ; *Precis* sucking at extended abdominal brushes of *Danaus chrysippus* Linn.** By Lieut.-Col. H. F. Stoneham, Kitale, Kenya Colony.

[Communicated by Professor Hale Carpenter.]

On 23rd July, 1935, I witnessed something out of the usual which may be of interest to Fellows of the Society. A newly emerged female of *Catopsilia florella* F. was ascending with fluttering wings in the familiar manner, with a male following her in circles, courting her in the usual way, when, suddenly, at about fifteen to twenty feet up, they copulated and flew away *in coitu*. This is the first time I have ever seen two butterflies actually copulate in the air. Other insects such as Carpenter bees regularly do it.

Another observation of mine may be of interest. Seeing an individual of *Precis octavia natalensis* Stgr. repeatedly flying after an individual of *Danaus chrysippus* (Linn.), I stopped to observe. The *Danaus* alighted on a weed with open-spread wings and, turning up the abdomen, extended its brushes. The *Precis* immediately settled behind it and, uncoiling its proboscis, sucked at the brushes. This went on for some time, the *Precis* at times fluttering into the air then re-alighting to continue the performance.

Euphydryas aurinia **(Rott.) from Ireland parasitised by *Apanteles bignellii* Marshall.** By D. S. Wilkinson.

A large number of *Apanteles bignellii* Marsh. was bred from larvae of *Euphydryas aurinia* sent to me by Dr. Kemp. In a note accompanying the material Dr. Kemp said: "The larvae were collected last August (1934) in West Kerry; they were brought to England and passed the winter at Weybridge. Whether the parasites attacked them in Kerry, when very young, or later in Surrey, is not known."

A. bignellii is an interesting species since it has never yet been recorded definitely from anywhere except Ireland, and also on account of the large masses of silk made by the pupating larvae, which is unusual in Palaearctic species.

But I did not exhibit this material on this score alone, but largely for the purpose of propaganda. This species of *Apanteles* was described by Marshall in 1885, and from that date until the present day there have been only one or two specimens of this common species in our National collection in the British Museum (Natural History), namely the material from Marshall's collection, material that, to say the least, is in very indifferent condition. Certain Fellows of the Society make a habit of preserving for the Museum all parasites that they breed; and I feel certain that there must be other Fellows who would be only too glad to assist in this way if they could be certain that their efforts would be appreciated. I can assure them that both the Imperial Institute of Entomology and the British Museum are desperately in need of bred series of Palaearctic species of Parasitic Hymenoptera, and that, in fact, work in many instances is being considerably held up by the lack of sufficient, good material.

A portrait of Jacob Hübner. By the President.

Dr. Neave exhibited a photograph of a portrait of Jacob Hübner recently acquired by the Society. No other portrait of Hübner is known to exist.

Wednesday, 16th October, 1935.

Dr. S. A. Neave, O.B.E., President, in the Chair.

Elections.

The following were elected Fellows of the Society:—Valentine Hugh Wilfred Dowson, Kut As-Sayyid Estate, Basrah, Iraq, and Alterbury Coulston Evans, Rothamsted Experimental Station, Harpenden, Herts.

Obituary.

The President announced the deaths of G. B. de B. Kershaw, elected in 1904, and of the Rev. Prebendary A. P. Wickham, elected in 1917.

Exhibits.

The Biology of *Encyrtus* (*Comys*) *infelix*, a remarkable Chalcid parasite of *Lecanium hemisphaericum*. By Dr. W. H. Thorpe.

C. infelix is an internal parasite of the Coccid *L. hemisphaericum*, a common pest of glass-house plants in England. It is of especial interest owing to the extra-

ordinary complexity of the relationship between the parasite larva and host. The respiratory adaptations in particular are perhaps the most remarkable known among parasitic insects.

The chorion of the egg is prolonged to form a hollow stalk which projects through the skin of the host and which enables the early (*metapneustic*) larval stages, within the body cavity, to utilise atmospheric oxygen. Later a totally different method of respiration supervenes. The connection with the egg stalk is broken and the larva (now *metapneustic*) becomes closely invested by a membranous sheath produced by the host. This sheath becomes fused on to the main tracheal trunks of the host in four places so that ultimately a connection is established between the cavity of the sheath and the lumen of the host tracheal system. The parasite is thus enabled to utilise the air contained in the respiratory system of the scale insect.

The British Museum Expedition to Eastern Ruwenzori, 1934–35. By Dr. F. W. Edwards.

Dr. Edwards gave an account of the expedition illustrated by lantern slides.

Wednesday, 6th November, 1935.

Dr. S. A. Neave, O.B.E., President, in the Chair.

Elections.

The following were elected Fellows of the Society:—George Frederic Bartholomeuz, L.M.&S. (Ceylon), D.T.M.&H. (England), The Medical and Sanitary Services, Colombo, Ceylon; Major J. E. Drysdale, Shordale, P.O. Umtali, Southern Rhodesia; G. M. Henry, The Colombo Museum, Colombo, Ceylon; Sheikh Abdur Rashid, 78-A, Model Town, Lahore, India; Charles Roberts, F.R.H.S., Llysmair, Ruthin, Denbighshire; Frank Henry Taylor, The School of Public Health and Tropical Medicine, University of Sydney, N.S.W., Australia; Dr. E. M. Walker, Department of Invertebrate Zoology, University of Toronto, Toronto 5, Canada.

Obituary.

The death of A. L. Rayward, elected a Fellow of the Society in 1907, was announced.

Exhibits.

A second record of *Callimorpha hera* in the Isle of Wight, 28.viii.1935; records of attacks on butterflies. By Sir Edward Poulton.

This moth was taken by hand, fluttering about with nearly the whole of the R.F. wing missing, in my garden at St. Helens, Isle of Wight. Mr. C. L. Collenette informs me that the only other I.W. record is of a capture in 1877, mentioned by South. Mr. H. F. Poole, Hon. Curator of the Shanklin Museum, also referring to South, writes:—"There is a somewhat chipped specimen in the R. H. Fox collection in the Museum but I can find nothing about it in his notes."

There can be little doubt that the R.F. wing, of which only an inner marginal

strip remains, was seized by a bird, probably attracted by the unfamiliar and conspicuous pattern but soon acquainted with the associated qualities.

A few recent observations of bird-attacks on British Lepidoptera may be appropriately recorded here :—

Dr. R. C. L. Perkins has called my attention to attacks on *Limenitis camilla* L. in the Isle of Wight, recorded by Ernest Cornell in 1919, *Entomologist*, **52** : 279. Referring to pieces torn out of the hind-wing the writer states that " this species is specially liable to injury of this nature, undoubtedly caused by birds. *L. sibylla* is more pursued by birds than any butterfly I know of, and only its peculiar flight saves it from being exterminated. I counted over 20 attempts at capture by birds in less than 15 minutes."

S. C. Scarsdall Brown in May 1933 observed a female sparrow fly into an apple tree, take, and except for the wings devour, a *Pieris rapae* Linn. at rest among the leaves (1935, *J. Soc. Brit. Ent.*, **1** : 70). An interesting contrast is afforded by a Spotted Fly-catcher seen by Mrs. M. D. Brindley to catch and break up a medium-sized brown moth (unidentifiable at the distance), in the road outside her house at Cambridge. " First the body was swallowed and then entirely the wings." The observation was made shortly before 8 July, 1935, when Mrs. Brindley wrote.

The flight of a male Wagtail in successful pursuit of a male " Yellow Underwing " is described by Mr. Champion B. Russell in a letter written 7 July, 1935. The bird, on the lawn at Stubbers, North Ockendon, Essex, chased " the moth which was flying upwards, made three circles before it overtook and caught its prey about 30 ft. up; then vol-planed down to the lawn. I urged my daughter to get the ' catch ' but the wagtail flew off about 10 yards and began pecking. She then retrieved the L.H. wing [exhibited] and the bird finished his meal at the end of the lawn. A sparrow which appeared to be chasing the wagtail was no doubt also pursuing the moth, but our country sparrows are very awkward in flight when they try to catch insects. The London sparrows are far more clever and active."

The following observation by Mr. F. Fincher of Randan Wood Poultry Farm, Woodcote, Bromsgrove, is of interest in relation to the attacks of wasps upon *Vanessa atalanta* Linn. and *Pieris rapae* Linn., etc., as recorded in our 1934 *Proceedings* (**9** : 27, 32, 33).

" On Sept. 23rd, 1934, I watched a ' Red Admiral ' feeding on some moist, cream-coloured substance situated between the bark and trunk of an oak stump which had been cut down in the late spring. Two large flies were also feeding, but the butterfly took no notice of them. Then a wasp flew up and appeared to be about to join the feast but each time it came near, the butterfly—by a quick jerky opening and closing of its wings, repeated while the wasp remained near—scared it away, and after several attempts it departed. During all this time the butterfly continued feeding."

The female Pied Wagtail feeding her brood on dragonflies, on the Cam, at Cambridge, July 1935. By Mrs. M. D. Brindley.

[Communicated by Sir Edward Poulton.]

The Wagtail visited the nest four times during the period of observation, her bill carrying what was evidently a mixed bag of insects. On two of the visits one

at least of the slender blue dragonflies * was included and taken into the nest, wings and all. The time of observation was necessarily short, because one could only get on terms with this bird while one was swimming in the river, as her nest was in a hollow willow stump inaccessible from the land.

Aquatic " Woolly bear " caterpillars, Pleasant Hope, near Parika, Lower Essequebo River, British Guiana. By Dr. J. G. Myers.

[Communicated by Sir Edward Poulton, who said Mr. W. H. T. Tams considered that the larvae probably belonged to the genus *Maenas* (Arctiinae).]

On 9th May, 1935, when I was selecting a camp site and was bothered by the shortage of potable water, I was taken to a pond near our present camp—a mere square hole dug in the back-yard, slimy and green, with a few bare fruit-stalks of *Nymphaea* sticking up in the subsiding water, and a few dropped stems of over-arching Pará grass. One or two small fish (*Lebistes* ?)—but most striking, 20 or 30 large dark grey " woolly bear " caterpillars swimming about freely in the water. To-day I collected some—the first chance I have had—have been so rushed looking for *Zenillia*. Put them in a bowl back at the camp, with some water and some stems of fallen-in Pará grass.

They swim with a serpentine movement, very freely, never landing either on side or on stems. Observed browsing (?) along submerged leaf or stem, at right angles, wiggling tail whole time like a tadpole. Head usually down—in fact, the whole anterior third completely submerged in swimming, and the rest awash. When swimming, a silvery air layer glistens with the movement (under the dark long hairs) exposed as the body bends—two wide lines along the spiracle tract, one on each side. Sometimes grazing on the bottom, then completely submerged, head down, but not walking.

The grass and lily stems are all fuzzy with brownish alga which, from the action of the caterpillars, seems to be the food. Certainly the leaves and stems were not gnawed; though one larvae nibbled some time at the broken surface of a grass internode which I had snapped. They work methodically along a stem and I think, clear off some of the fuzz. A boy of the family to whom the pond belongs said the larvae fed on this " mass " (moss).

There is a curious resting (?) or breathing (?) position. For an hour or more a larva will float motionless with front third curved downward and under like a shepherd's crook, and the rest of the back just awash. Sometimes, but by no means always, the blackish hairs part, revealing the bright yellow shorter pile of that part of the back, quite dry though slightly below the level of the water, which is kept back by the upstanding black hairs. This open split may be 20 × 8 mm. or only 2 × 1, and is often absent. With a large split the larva is quite conspicuous black and orange, instead of dingy dark grey. The larva hunches up and widens, and it is then undoubtedly that the two lines of air along the body are replenished. If

* Almost certainly the male of *Calopteryx virgo* L. For recent records of this and other dragonfly prey of birds see 1932 (1933) *Proc. R. ent. Soc. Lond.*, **7** : 97 (with F. J. Killington's footnote); 1934, *ibid.*, **9** : 10, 41, 42. The Rev. F. C. R. Jourdain, the author of all the notes on the food of British birds in Witherby's " Practical Handbook," informs me that the Hobby, *Falco s. subbuteo*, is exceptional among British birds in the frequency of its attacks on dragonflies.—E.B.P.

one pushes down a larva with the split widely open, it closes at once * like a zip fastener. The larva may make a few rapid wriggles to right itself and then continues floating in the same crook position practically submerged, but with the dark hairs closed. When similarly disturbed during active swimming, it hunches up into the crook position and floats passively like an inert piece of rubbish, as though playing possum.

The whole night is passed floating freely at or just below the surface—certainly awash—in the crook position, with the hair covering all closed; and out in the open water.

[Dr. E. A. Cockayne has examined and written the following description of these remarkable larvae.—E.B.P.]

The larva is stout, 45 mm. in length with the ground-colour blackish brown on the dorsal and lateral surface to a point just below the level of the subspiracular verrucae, and pale greyish-brown elsewhere. The head is black, and the legs are of the size and structure usual in Arctiids.

All the trapezoidal verrucae are densely clothed with orange hairs 2 mm. long. These hairs are very thin and many are bent backwards near the middle, and though firmly attached they can be pulled out entire. Proximally they end in a sharp point, but the free distal end is rounded and for their whole length they are covered with innumerable short and extremely delicate hair-like processes. The internal and posterior half of the supra-spiracular verrucae is clothed with similar hairs, but they are straighter and dark brown in colour. Towards the anal end of the larva these modified hairs are straight, rather thicker, and clubbed at the distal end, resembling a butterfly's antenna in shape, but for their whole length, including the clubbed extremity, they are covered with similar hair-like processes.

The remaining part of each supra-spiracular verruca gives origin to long silky hairs, 6 mm. long, which curve inwards or inwards and backwards, concealing the trapezoidals. The silky hairs taper to a finely pointed extremity and are simple, but for a few short spinous processes near the base. Similar long hairs arise from the subspiracular verrucae, but most of them have short slender lateral spines arising all the way along the shaft. The hairs arising from the other verrucae are shorter and in some the lateral spines are longest towards the distal end.

The prothoracic spiracles are large, oval, and black, but each lies in a deep fold of skin and is very difficult to find. The other spiracles are black, but are smaller and nearly circular. They lie hidden between the supra- and subspiracular verrucae and are invisible until these are stripped of hair and separated.

The anterior four pairs of prolegs are provided with 8, 8, 9, and 8 crochets respectively, of which the anterior and posterior are the shortest and the central pair are the longest. The crochets are thin and black with large hooks. The anal prolegs have no crochets, but on the distal end is a semicircle of thicker cream-coloured chitin. In one larva the aborted prolegs are almost flush with the skin, but in the other they are protruded, appearing as fleshy cylinders, each with two black chitinous, setiferous plates, one on the outer and the other on the posterior aspect.—E.A.C.

* Normally, at the end of breathing(?), the split closes fairly rapidly (more so than when it opens) but the larva continues floating in the same position for some time, before resuming the energetic wriggling movements of swimming.

[Mr. W. H. T. Tams having kindly lent me three papers on aquatic S. American larvae, evidently allied to those found by Dr. Myers, I am glad to add the following translation by Mr. L. Nell of the relevant paragraphs.—E.B.P.]

(1) *Memoria sobre orugas acuáticas de la familia de Bombycidae.* By Dr. D. Carlos Berg. (1876, *An. Soc. ci. Argentina*, **2** : 184–190.) [Translation.]

The first discoverer of aquatic larvae with stigmata and tracheae was Mr. Bar in Guiana.*

In the same year that Bar communicated the discovery of his aquatic larva, I without knowing of it, found, in the Banda Oriental region of Uruguay, another species of the same character.

In view of the discussions roused by Mr. Bar's paper I will not delay further the publication of my observations.

During the second half of September 1873 I observed in the Coralito River in the Banda Oriental region of Uruguay some very hairy larvae about 7–8 cm. long. Some swam near the surface of the water and others were settled on completely submerged plants.

I took to Buenos Aires 8 specimens with a number of the plants (*Syena* sp.?) as food. Despite the journey the larvae were soon restored and flourished in a large vessel in which I renewed the water daily. Two moulted after some days. The larvae fed readily and soon ate up the stock of the food-plant. The plant was not to be found near Buenos Aires and of other plants the larvae ate only a little of *Polygonum acre*. All tried to leave the vessel; outside they moved about restlessly in all directions without pupating and all efforts to rear them to the adult stage failed. Those that had eaten *Polygonum acre* and had been forced to remain in the water died of diarrhoea; the others, which were free to move in my room and to enter the water if desired, died of hunger.

[During a further visit in April 1874 the author examined the Coralito River and some small streams.]

Syena did not occur in these small streams and the larvae in them occurred on plants of *Potamogeton pusilla*. When the plants were disturbed the larvae on them jumped and curled up into rings near the surface of the water.

[Having collected 40 larvae the author took them to Buenos Aires, where some were placed in a zinc box containing earth, stones and turf within a vessel containing water and food-plants. Others were put into a large vessel with pieces of wood floating on the water to accommodate the larvae that wished to leave the water.]

In these containers I kept them safely for two-and-a-half months. They fed readily on *Potamogeton pusilla* and having eaten the supply of this, they accepted *P. crispa*, *Hydrocotyle natans* and *Myriophyllum proserpinoides*, which last, however, was the least preferred. All these plants were collected near Buenos Aires every two or three days. Nearly all the larvae moulted, some twice—at the end of May and in mid-July. From mid-July, however, there was a change. Gradually they

* Bar, C., 1873, Sur un genre nouveau de Lepidoptères de la tribu des Bombycidae et dont la chenille est aquatique. *Ann. Soc. ent. Fr.*, (5) **3** : 297–302.[1]
Laboulbène, A., Observations sur le genre *Palustra*. *Tom. cit.* : 303–306, figs.
Guenée, A., Note au sujet de la *Palustra laboulbeni*. *Tom. cit.* : 542–544.
Goossens, T. Communication sur chenilles aquatiques. *Tom. cit.* : xii–xiii.
M'Lachlan, R., 1874, *Proc. ent. Soc. Lond.*, **1874** : vi.

[1] [Includes a description of *Palustra laboulbeni* Bar.]

lost their appetites, became very restless, left the water repeatedly, seeking sunshine, and many were drowned at night. Early in August not one single larva was alive. In spite of every care it was not possible to bring them to hibernate.

[In July (winter) 1876 the author made another journey to Uruguay to study the hibernation of the larvae.]

The larvae were found as before, usually at a depth of $\frac{1}{4}$ foot to 2 feet. None was out of the water or near the surface.

[Forty were brought to Buenos Aires and the author was attempting to breed them at the time he addressed the meeting on Sept. 1st, 1876.]

Some of the larvae are living in stream water and others in cistern water with different kinds of aquatic plants, so that their preferences may be noted.

Habits of the larvae.

The larva is sociable and lives in water. It has been proved that water is its special habitat, for I have found none out of the water on the banks or ravines of the streams in which it lives. The larvae never tried to leave the water in captivity unless the supply of food ran short or the water was dirty or very cold. The larvae kept out of the water did not feed, even if the plants offered were wet, but moved restlessly in all directions. On being replaced in the water they swam vigorously and soon began to feed. All moulted in the water, attached to the submerged parts of the plants.

Various aquatic plants served as food, especially *Syena* and *Potamogeton*.

The larvae breathe through stigmata and tracheae like terrestrial larvae and their stigmata are almost the same, but smaller and have a less raised and distinct "peritrema." The larva carries the supply of air (required for breathing) on its back among tufts of hairs so that small bubbles are formed, between the long, greasy hairs extending over the back. From time to time the larvae come to the surface to renew the air-supply. To do this the posterior end is raised out of the water, and the air changed. When the water is at a low level and the plants are near the surface the larvae often take up a position enabling them to renew the air continuously. In this case they settle on the plant with the greater portion of the body submerged but with the end, the last two or three segments of which have open hairs, out of the water, so that the circulation of air is uninterrupted.

This method of breathing is not common. For instance, the larvae that I am breeding do not always use it, though the conditions in which they live permit of their doing so. They remain a good deal in the deepest parts of the vessels. The renewal of air takes place very irregularly. Some larvae appear very frequently at the surface of the water, others every two or three hours, and others remain six to eight hours at the bottom of the vessel. It seems that they can exist for some days on the quantity of air carried on their backs, for during the rains I did not see them rise to the surface, nor did I see one when the water in the Coralito River had risen much. The same thing will also occur in winter; they will rise only on fine, warm days in order to renew the air supply. Moulting takes place as usual, the larvae retaining their hold on the plant during the process. This act does not appear to be so delicate as in terrestrial larvae and the cast skin afterwards appears on the surface of the water.

The larvae swim with ease, making eel-like movements beginning at the posterior end. They do not usually remain far from the surface of the water and the extremity is always much raised.

Examining them closely one could easily see, on the segments, the little air-bubbles which resemble silver pearls.

Out of water and without food a larva lived three days in October, whereas in July (winter) larvae lived for eight days without food.

(2) *Palustra azollae* y *Palustra tenuis.* By Dr. D. Carlos Berg. (*An. Soc. ci. Argentina*, **2** : 241–246.) [Translation.]

[The author draws attention to his previous paper on an aquatic larva from Uruguay (see above) that lives *in* the water, though breathing through stigmata and tracheae.]

I now deal with the larva of *Palustra azollae* which differs from those mentioned above in that it lives on the water, being a transition form between truly aquatic and terrestrial larvae.

I found the first specimens on 21st December (summer) 1875 in the Trigre on the small aquatic plant *Azolla filiculoides*. It developed in one month in my room, living in a vessel with the food-plant, and an adult male emerged.

[The author received other specimens and bred them.]

The larva is aquatic to a certain degree, being always found on water plants, e.g. *Azolla filiculoides* and *Lemna* spp.* These being floating plants, the larva eats only the parts that emerge from the water and never those in direct contact with it. Not even when it descends into the water does the larva feed on the submerged parts. It descends usually at mid-day in hot weather when exposed to sunshine.

Descending into the water the larva does not as a rule go far from the plants to which it is anchored. But when it remains in the water for a long period, as during mid-day sunshine, it is always seen with its head out of the water, feeding on the dry parts of the plants. When submerged the larva is surrounded by air that forms a kind of bubble around it as with the aquatic spider *Argyroneta aquatica*. It swims on the surface of the water only. The larva always tends to keep its anterior end above the water, while the posterior end is submerged, apparently in order to facilitate excretion or rather to separate the excreta from the anus during defaecation. The faecal matter is of a somewhat viscous and sticky nature, and as the larva has no special organs to assist in getting rid of this substance, it requires the help of the water.

Pupation takes place on the plants and sometimes on the banks of the streams in which the larvae live. Those that I bred in my room generally made their cocoons on the cloth which covered the vessel.

(3) *Estudios lepidopterológicos acerca de la fauna argentina y oriental.* [Lepidopterological Studies regarding the fauna of Argentina and Banda Oriental of Uruguay.] By Dr. D. Carlos Berg. (*An. Soc. ci. Argentina*, **1877**.) 1 col. pl. [Translation.]

* In captivity it fed on other plants as well, especially species of *Polygonum*, *Hydrocotyle* and *Commelina*.

Palustra burmeisteri.

[The author recapitulates the information in the first paper, 1876, *An. Soc. ci Argentina*, **2** : 184–190, and then continues.]

The larvae were dying when Señor Günther offered me the use of his aquarium with running water. In this vessel the larvae fed voraciously on a species of *Polygonum*, and remained near the pipe by which the water entered the aquarium. On September 24th one larva (probably the one that had moulted previously) came out of the water and made its cocoon and pupated among some plants of *Commelina cayennensis*. After six weeks a female emerged. One of the others, that had been placed in a cage on account of their restlessness, produced a male which did not develop well as it was mutilated. The others died in their cocoons. During four years I obtained only these two adults out of 91 larvae of this new species of *Palustra*.

[There follows a description of *P. burmeisteri*.]

Three S. American moths of the genus *Palustra*—*P. burmeisteri*, *azollae* and *laboulbeni*—are well figured in Mr. W. P. Pycraft's interesting article " Some new facts about aquatic caterpillars " (*Ill. Lond. News*, 19 May, 1934, p. 768); also the Hungarian moth, *Diacrisia* (*Rhyparioides*) *metelkana*—an Arctiine, as are the species of *Palustra*—of which the larva was observed swimming freely by the late Hon. N. Charles Rothschild. My friends Mr. W. H. T. Tams and Maj. E. E. Austen have kindly sent me the following translation of Spuler's description of its habits.—[E.B.P.] :—

" Spuler in Hoffmann, *Die Gross-Schmetterlinge Europas*, says of the larva of *Rhyparioides metelkana* Led. :—The larva lives in reed-beds on and in the water, on which it can readily progress, from the beginning of May to the middle or end of June, on different plants such as *Caltha*, *Iris*, *Plantago*, also *Nymphaea alba*, eating out round holes more towards the middle, particularly on *Euphorbia palustris*, chiefly feeding at night. It spins a white or yellow cocoon on the stems or leaves of the food-plant, changing into a stout, blackish-brown pupa with red-edged segments, hardly perceptible tufts of yellowish hairs, and a thorn-like cremaster. Thurau has reared the species without difficulty on low plants, particularly dandelion."

A spider, *Aphantochilus* sp., mimicking an ant, *Cryptocerus* (*Cephalotes*) *atratus* L., taken 24 May, 1935, at Kobarima, N.W. District, British Guiana, by Dr. J. G. Myers. By Sir Edward Poulton.

The ant-like behaviour of the exhibited mimic is described in the following extracts from my friend's letters :—

" 27 *Aug.* 1935. Under separate cover I am sending the most extraordinary and deceptive ant-mimic I have ever seen—it bears such a specific resemblance in appearance and movements to a very specialised and curious ant, *Cephalotes atratus*. Most spider mimics give themselves away when handled, but this moves sluggishly like the ant and makes no attempt to let itself down on a silk thread."

From letter of 4 Sept. 1935 :—

" 24th May, 1935. Kobarima, N.W. District, British Guiana. Extract from Journal, No. 5135 :—

"'Noticed what I thought was *Cephalotes atratus* sitting quietly on a white flattened spider egg-cocoon exposed on a leaf, making a very conspicuous combination. I wondered what the ant was doing with the spider egg-sac. Thought probably dead, perhaps fungus-killed, as so often in this rain forest. Picked it up and after handling for some time found it was a spider. The sluggish gait when disturbed was exactly that of *Cephalotes* and there was no attempt to drop at the end of a silk thread.'

"The young spiders on hatching (same tube) were not at all ant-like."

The model and mimic were exhibited at the Linnean Society Conversazione on 17 October by Dr. S. Finnegan who determined the genus, *Aphantochilus*, of the spider, while Mr. H. Donisthorpe had corrected the genus of the ant.

Fig. 1.

Dr. V. B. Wigglesworth has kindly sent me the following note of an observation which suggests that such resemblances may in certain cases be aggressive, although I believe that they are relatively rare and that Dr. Myers' spider is certainly not one of them :—

"When at Yaba near Lagos, Nigeria, some years ago, my attention was drawn to what I took to be two ants fighting. On looking more closely I perceived that one of the pair was a spider of remarkably ant-like appearance. When they were separated I was struck by the ant-like movements of the spider. On this occasion the spider was undoubtedly the aggressor."

Martins and Wasps nesting together. By F. W. Frohawk.

[Communicated by Sir Edward Poulton.]

On August 9th, 1891, when visiting the late Mr. G. F. Wilson's delightful experimental gardens at Wisley, Surrey, my attention was drawn to a novelty of much interest. Under the gable of the gardener's house a pair of martins (*Chelidon urbica*) had built their nest, and beside it was attached the nest of the wood wasp

(*Vespa sylvestris* L.) as represented in the accompanying drawing which I made at the time. While making the sketch, I noticed both birds and wasps flying in and out of their respective nests, taking no notice whatever of each other, and appearing to be most peaceful neighbours.

I again visited the nests on Aug. 29th and found the wasps' nest in rather a dilapidated condition, caused by the strong winds blowing directly upon it, which had torn away the outer walls from below, leaving the cells exposed to view, and it was occupied by only two or three wasps and several earwigs. Upon removing it, I found the upper part firmly attached to the timber roofing of the gable, where it measured 4 in. in diameter, 5½ in. through its greatest width, and 4 in. in depth. The wasps passed in and out through two small apertures at the bottom. It was also cemented on to the martins' nest on one side. The wasps' nest was of an ashy-grey colour, the walls being composed of delicate overlapping layers of wasp's paper.

Comments on the above observations by Sir Edward Poulton.

This interesting record was recalled to the author's mind by reading Dr. J. G. Myers' paper on the nesting together of birds and social insects (1935, *Trans. R. ent. Soc. Lond.*, **83** : 11), and it certainly proves that a condition of mutual tolerance between these Vertebrate and Invertebrate companions exists and is available for conversion by natural selection into a constant and normal association. These thoughts lead naturally to the more elaborate association which enables the African Honey Guide, *Cuculus indicator*, to obtain a meal from scattered fragments of the bees' nest to which it has directed the attention of man. The origin of this most remarkable behaviour is a fascinating problem to which I briefly alluded in 1931 * and upon which I have received the following illuminating letter by Dr. V. G. L. van Someren :—

" *Nairobi :* 21 *Oct.* 1935.—The Honey Guide is parasitic on several other species which nest in holes either in trees or in banks. Like the Cuckoo, once the female has deposited her egg or eggs, she takes no interest in them. She therefore cannot ' teach the young ' at the time they leave the nest and are being fed by their foster parents.

" However, it is a known fact, that when the young are old enough to leave the care of the foster parents they join up with others of their own species, for a time, and doubtless it is then that they learn the ' trick.' "

Thus we are enabled to understand how the successful efforts of an exceptionally intelligent Honey Guide at some remote epoch were learned by others until they gradually spread throughout the species and have been learned afresh by each succeeding generation until the present time. And indeed, although in a very simple form, we may witness the same kind of association in the robin which appears directly a man comes into the garden with his spade, and if the conditions were such that the gardener required to be shown the way to his work it is not difficult to believe that the robin would become his guide and that even now the bird's presence may serve as a reminder.

Returning to the Honey Guide our President has told me of the belief that the

* 1931, *Brit. Assoc. Rep.* **1931** : 92.

Ratel or Honey-Badger is also directed by this bird to a bees' nest, as recorded by Sparrman in his classical " Voyage to the Cape of Good Hope," 1786, in the following passages which he has very kindly sent, copied from Vol. II in the Society's library :—

Pages 180–181.

" The *ratel*, a sort of weasel or badger, by nature destined to be the adversary of the bees, and the unwelcome visitor of their habitations, is likewise endued with a particular faculty for discovering and attacking them within their entrenchments. His long claws, besides assisting him in digging the dark subterraneous passages which serve him for an asylum, are likewise of use to him in the occupation he is frequently employed in of undermining whole colonies of bees. Now, as a man placed at the mast-head can easiest descry a sail or land at a great distance about sun-set, so probably this time of the day is the most convenient for the ratel to look out for his supper; for he is likewise said to be particularly attentive to his business about sun-set, when he will sit and hold one of his paws before his eyes, in order to modify the rays of the sun, so as to render them inoffensive to his organs of sight, and at the same time to have a distinct view of the object of his pursuit : and when, in consequence of peering in this manner on each side of his paw opposite to the sun, he sees any bees fly, he knows that they are at this time going strait forward to their own habitation, and consequently takes care to keep in the same direction as that in which they fly, in order to find them. He has besides, as well as the Hottentots, the Caffres, and the peasants of the Cape, the sagacity to follow a little bird, which flies on by degrees with the alluring note of *cherr, cherr, cherr*, and guides its followers to the bees' nest. This self-interested betrayer of the bees, to which I have many times been obliged for the honey I have eaten in the course of my travels through the desert, is the little *Cuculus indicator*, which I have described and given a drawing of in the Phil. Trans. and propose to make mention of a little farther on." (See p. 74.)

Pages 186–187.

" The *bee-cuckow*, (*Cuculus indicator*) which I made mention of just above, in describing the *ratel* at p. 181, deserves to have more particular notice taken of it in this place. It has, however, nothing remarkable in it with regard to its size and colour, as, on a cursory view, it appears in these points not to differ from the common sparrow; excepting indeed, that it is somewhat larger, and rather of a lighter colour, with a little yellow spot on each shoulder, and the feathers of its tail dashed with white.

" It is, indeed, merely with a view to its own interest, that this *cuckow* discovers the bees-nests to man and the *ratel* race, as it is extremely fond both of honey and bees-eggs; and it knows that when a bees-nest is plundered, some of it is shed, which consequently falls to its share, or else some part is left by the plunderers as a reward for its services. Nevertheless, the way in which this bird communicates to others the discovery it has made, is as surprising as it is well adapted to the purpose."

Sparrman then continues to give a long account of the bird and its relations with man. Dr. Neave also tells me that he " can certainly confirm that it is also

the native belief in Central Africa that this association between the ratel and the bird exists."

The description of *Cuculus indicator*, the "Honey Guide," was published in 1777, *Phil. Trans.*, **67** : 43–7, pl. 46, and is appended to a letter (pp. 38–42), written from Gottenburg, September 16, 1776, to Dr. John Reinhold Forster, F.R.S., by Dr. Andreas Sparrman of Roy. Acad., Stockholm. It is here explained that the collection of African birds had been mostly destroyed by fire in Sweden but that two specimens of the Honey Guide, believed to be females, had escaped and were the material from which the description had been written.

The following interesting statements have been copied from the description of the bird :—

"Not only the Dutch and Hottentots, but likewise a species of quadruped, which the Dutch name a Ratel,* are frequently conducted to wild bee-hives by this bird, which as it were pilots them to the very spot" (p. 43).

. . . . . .

". . . nay, if it should happen to have gained a considerable way before the men (who may easily be hindered in the pursuit by bushes, rivers, and the like) it returns to them again, and redoubles its note, as if to reproach them with their inactivity. At last the bird is observed to hover for a few moments over a certain spot, and then silently retiring to a neighbouring bush or other resting-place, the hunters are sure of finding the bees nest in that identical spot, whether it be in a tree, or in the crevice of a rock, or (as is most commonly the case) in the earth. Whilst the hunters are busy in taking the honey, the bird is seen looking on attentively to what is going forward, and waiting for its share of the spoil" (p. 44).

. . . . . .

"It is further observed, that the nearer the bird approaches the hidden hive, the more frequently it repeats its call, and seems more impatient" (p. 45).

A reason for the Order in which the Queen Wasp constructs the cells of the comb ; a method for computing the number of cells in a comb, and an instance of the limitation of the instincts of Wasps. By O. H. Latter.

A. *The Order in which the Cells are built.*

It is common knowledge that the foundation of the nest of any species of our Social Wasps consists of a footstalk of wasp-paper attached at its upper end to a root, or branch, or other relatively firm object, and carrying at its lower end a few hexagonal cells of the same material; the whole, together with its protecting envelope, being fashioned by the foundress queen unaided. Janet (2), however, appears to have been the first to establish the fact that this first comb is centred on a group (core) of four cells, and not, as de Saussure (1) evidently imagined, on a single one. Dr. Ormerod (3) came very near to anticipating Janet, for he showed (pl. V, fig. 1, and pl. VI, fig. 1) the four-celled stage; and wrote on p. 188 : "The footstalk . . . affords support to these three or four little cells. . . . I have always found four," and on p. 189 referred to "the four primal cells"; yet it seems certain that he did not realise that four cells always constitute the core around which the queen constructs the first comb, which when she has completed it consists of thirty cells.

* Probably a new species of badger.

The object of the present paper is to show that there are mechanical reasons (1) for a four-celled core in preference to any other; and also (2) for the order, as pointed out by Janet (2), in which the queen constructs the subsequent cells.

(1) Four is the maximum number of hexagons that can impinge on the line that forms the sides of two, and that connects the angles of the other two; namely, in fig. 1, the line (cell wall) common to cells 2 and 4, and connecting the lowest angle of cell 1 with the highest angle of cell 3. Now the axis of the suspensory footstalk is directly continuous with this cell wall; and the expanded lower end of the footstalk forms the roof of each of the four primal cells; thus giving the maximum security to the support of the comb. It is to be remembered that the weight of the comb continues to increase with the growth of the queen-reared larvae until such time as the first workers emerge; and that no further supports are added until the workers take over from the queen all the constructional duties.

(2) The four core-cells are built more or less *pari passu*, the queen securing her foothold on the footstalk: they are arranged as shown in end-on view by fig. 1. Now in order to enclose completely this group of four ten cells are required. Of these ten four, namely Nos. 5, 6, 7, 8, are already provided with two existing walls; while the other six abut on one wall only of the four in the central group. Janet (2) showed, and I can confirm his observations, that cells Nos. 5, 6, 7, 8, are as a matter of fact, those which the queen does add first to the central group of four in constructing the enclosing ring, which I will designate Ring 1. A glance at fig. 2, which shows the comb at this stage, makes it obvious that when Nos. 5–8 have been added there are then three walls in existence for Nos. 11 and 14, and two such for the remaining four, Nos. 9, 10, 12, and 13 needed to complete Ring 1. It is important also to note that, as observed by Dr. Ormerod (: 201), each pellet of building material (wasp-paper) is applied to three sides of any one cell that is in course of construction; and that thus the cell walls are firmly knit with one another, and much greater strength given to the whole comb.

To form Ring 2 completely enclosing Ring 1 sixteen new cells are necessary: of these, ten (Nos. 15–24 inclusive) already have two walls existing, but the other six have only one; when, however, Nos. 15–24 have been built, as is actually the case, then these six are equipped with three walls each. It seems probable that the reason for avoiding work on a cell which presents one wall only already built is that it is difficult for the insect to secure a satisfactory foothold; whereas if there are at least two walls already standing and inclined towards each other, a firm foothold is assured; also a more extensive interlacement of the building material is effected.

Since the foundress queen does not carry comb-building beyond the 30-celled (4 + 10 + 16) stage, the order of events in subsequent rings is conjectural; but it is at least probable that the workers continue the building in the same way, always first constructing new cells where the outer walls of cells in the preceding ring afford two completed faces of the hexagonal compartment.

If it be assumed that each subsequent ring is completed before its successor is begun, as seems probable, it will be seen that in each ring there are six, and only six, places where there is but one wall presented for further addition of cells; namely, along the radii passing (1) from cell 1 through cells 9 and 25; (2) from cell 1 through cells 10 and 26; (3) from cell 2 through cells 11 and 27; (4) from cell 3

through cells 12 and 28; (5) from cell 3 through cells 13 and 29; (6) from cell 4 through cells 14 and 30. Thus as the circumference of the comb increases, the number of places presenting two walls for the next series of cells becomes greater, while that of those presenting one only remains at six. The chances, therefore, of a worker beginning a new cell at one of these bad foothold places become fewer and fewer as each comb increases in size. Janet was able to satisfy himself that succeeding combs are also centred on a group of four cells.

B. *A Method of estimating approximately the number of Cells in a Comb from the Nest of a Social Wasp.*

As already stated, the central group consists of four cells; Ring 1 of ten; Ring 2 of sixteen; and if further successive rings be added, it is found that Ring 3 consists of twenty-two; Ring 4 of twenty-eight; Ring 5 of thirty-four, and so on. There is, then, an Arithmetical Progression, whose first term is 4, and whose "common difference" is 6. All that is necessary, therefore, to ascertain the total number of cells in a comb that is approximately circular, as indeed large combs are, is to count the number of rings, reckoning the core as one ring;—this is done by counting the number of cells along any diameter; then, since each ring will have been crossed twice by the diameter, halve that number, and apply the formula

$$\text{Total} = \frac{n}{2}(2f + (n - 1)6)$$

which expressed in words is "Total equals half the number of rings (n) multiplied by twice the first term (f) plus one less than the number of rings ($n - 1$) multiplied by the common difference (6).

Thus, in a 14-ringed comb the total number of cells is 602, as the following shows—

$$\begin{aligned}\text{Total} &= \frac{14}{2}(2 \times 4 + 13 \times 6) \\ &= 7(8 + 78) \\ &= 7 \times 86 = 602.\end{aligned}$$

Or, if formulae are disliked, the total can be arrived at by, (1) multiplying the number of rings by 3, (2) adding 1 to that product, (3) multiplying the sum of (1) + (2) by the number of rings. Thus in the same comb—

$$\begin{aligned}&(1)\ 14 \times 3 = 42 \\ &(2)\ 42 + 1 = 43 \\ &(3)\ 43 \times 14 = 602.\end{aligned}$$

It must be mentioned that de Saussure (1) in the middle of last century showed that the number of cells in a comb can be calculated by the formula for an Arithmetical Progression; but he was in error in thinking that there is a single central cell; the arithmetical progression formula, however, applies equally to either condition.

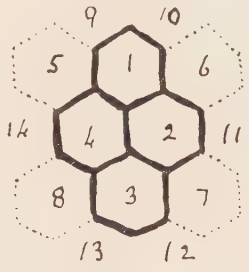
References.

1. de Saussure, H. F. 1853–8, *Monographie des guêpes sociales.* Genève.
2. Janet, C. 1895, *Études sur les Fourmis, les Guêpes et les Abeilles.* Limoges.
3. Ormerod, E. L. 1868, *Natural History of Wasps.* London.

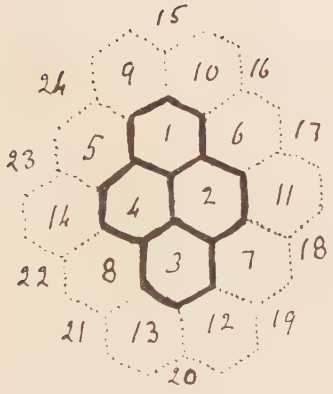
C. *Limitation of the Instincts of Wasps.*

One night in mid-September a badger dug out from a bank in my garden a wasps' nest, completely destroying all the combs, but leaving a small portion of the wrappings attached to the top of the excavated hollow, and almost the whole of those that had covered the far side of the nest. Next day there were a good many wasps flying around the hollow, and crawling over the remnants of the wrappings. A few days later the whole of the far side wrappings had disappeared, and from the top of the hollow there was hanging a small globular nest, rather larger than a cricket ball, but differing from a normal nest in having no entrance at its lower end—the wasps were making their exits and their entrances at many spots on the sides.

1



2



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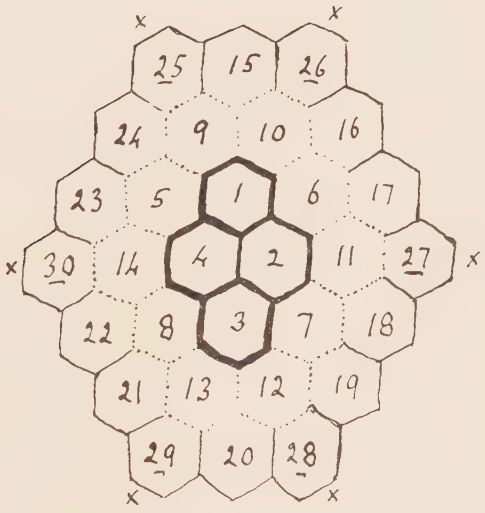

4

FIGS. 1–4.

In all the figures the cells are diagrammatically represented in cross-section. The walls of the core cells are represented by heavy lines; those necessary for the completion of Ring 1 by dotted lines; and those necessary for the completion of Ring 2 by light continuous lines.

Fig. 1. The four core cells, and (indicated by numbers only) the positions of those of Ring 1 that are first added; fig. 2. The first four cells of Ring 1 are completed; and the positions of the remainder of this ring indicated by their respective numbers; fig. 3. Ring 1 completed; and the positions of the first ten cells of Ring 2 indicated; fig. 4. Ring 2 completed. The comb now consists of thirty cells, the full number that the queen constructs.

The crosses and underlined numbers indicate the six radii along which only a single wall is offered for cells in the next and in all succeeding rings.

Feeling certain that no comb had been left by the badger, and being rather puzzled by the behaviour of the wasps, I, after a few days, cut the nest down and carefully examined it. As I expected, it contained no comb, but consisted merely of a series of roughly concentric overlapping wrappings. Hidden away, however, near its centre was the foundress queen who somehow had escaped destruction by the badger.

The instincts both of queen and of workers thus appear to be narrowly limited. After the queen has herself built the first comb of thirty cells thenceforth her instinct is to lay eggs—she cannot "go back on her tracks" and a second time build a small comb. The workers in their turn normally always add cells to cells already existing, either laterally or by suspension to cells in a comb above. In this instance there was left no comb to which they could make additions. Their other constructional instinct is to place wrappings around (or instead of smaller wrappings as the nest increases in diameter) others already existing to protect the brood and the mother of them all. To this instinct they were able, doubtless stimulated by the survival of the queen, to give free play; for a portion of the wrapping hung from the top of the hollow, and that on the far side was close at hand ready to be re-pulped for the protection.

Observations by Mr. T. W. Chorley, F.R.E.S., on dragonflies attacking the tsetse fly *Glossina palpalis* R.D. By Professor G. D. Hale Carpenter.

Mr. Chorley in a letter dated 18th July, 1935, wrote as follows from Uganda.

"In March this year I visited a landing on Kome island to measure the clearing with a view to finding out the minimum size of a clearing required to prevent tsetse crossing from one side to the other. Whilst I was measuring the foreshore one of the native collectors informed me that a dragonfly had taken a tsetse off his fez, and that the tsetse had cried out loudly, to use his own words. I found that there were numerous dragonflies hovering and flying about six inches above the ground, following the boy as he walked about; the same thing applied to myself and whenever we stopped so the dragonflies stopped and alighted on, or hovered around sticks, grass, etc. I then made the boy walk in front of me and two tsetse settled on his back: I told him to stand quite still. One of the tsetse flew on to a bare part of his body I presume in order to feed, and several dragonflies darted at it and I definitely heard a noise resembling several short squeaks. The flight of the dragonfly was so fast that it was impossible to see anything. I then thought of an idea, and obtained a piece of thread off an old fishing net such as is used by the Basese and caught a tsetse. I tied the cotton on to the tsetse around the metathorax and allowed the tsetse to fly, holding the cotton at one end. The tsetse's flight was extremely slow owing to the weight of the cotton, dragonflies made for it but none of them killed it, merely catching hold of it and letting it go, the tsetse making the squeaking noise. I then cut up a banana stem, and selected a few strands of very fine fibre, caught another tsetse and tied it on to the fibre in the same manner. This fibre is very light and can hardly be seen when held up to the light: it is not unlike extremely fine silk. The tsetse was able to fly almost naturally and darted here and there with the dragonflies after it: one overtook the tsetse in a fraction of a second and whilst I was pulling in the fibre the dragonfly let go. On examination the tsetse was quite dead: the entrails had been eaten.

I did this several times and found that every time the entrails were eaten, and every time the dragonfly caught a tsetse the piercing squeaks were heard. I tried letting go the fibre when a dragonfly had caught a tsetse and followed it with my eyes until it settled, and quietly crept up and endeavoured to watch what happened but could never see exactly what did happen. It was interesting to note that the dragonflies would not take any other kind of flies tied on the fibre although I tried the larger ' lake flies,' house flies and small moths. I have no doubt whatever that tsetse are scared of dragonflies, because on entering the forest a few yards from the edge of the clearing I found tsetse abundant whereas no dragonflies would follow into the forest but flew back and settled on various sticks, grass, etc., that were scattered about where the fishermen had been clearing. No sooner did I leave the forest than tsetse would follow, but the dragonflies would immediately come back as well, and in a short time all but two or three tsetse had disappeared : on the other hand, quite a dozen were around me in the forest and all were hungry and biting freely. I am quite convinced that these dragonflies are a natural enemy of *G. palpalis* and help to prevent it from crossing clearings."

Professor Carpenter said it was very interesting to hear of such clear evidence of the destruction of *Glossina palpalis* by dragonflies. He had recorded this occurrence in 1920 (*A Naturalist on Lake Victoria*, pp. 53–4. London, 1920), and during the years before the war, when investigating the bionomics of the fly, had been much struck with the clouds of dragonflies which always accompanied anyone walking along an open shore. Like Mr. Chorley he had often seen dragonflies dart at tsetse, and heard the latter squeal, but he had not thought of Mr. Chorley's ingenious plan.

Mr. Chorley had not mentioned one point that had always struck him : not only do dragonflies *follow* a moving person but they will *precede* him, flying backwards in front of him with the head only a foot or so away from his knees. A hippo grazing on an open shore had been seen by field glasses to be similarly attended, and it is probable that the dragonflies await heavy full-fed flies to pounce upon them as they fly away. This is supported by Mr. Chorley's observation that the abdomen is the first part to be devoured.

Professor Carpenter showed some of his own photographs to illustrate the type of lake-shore to which Mr. Chorley had alluded.

A Hesperid observed to emit fluid from the anus to moisten dung for absorption.

By T. H. E. Jackson, F.R.E.S., Kitale, Kenya Colony.

[Communicated by Professor G. D. Hale Carpenter.]

" I was watching a skipper, a *Gegenes* of the *niso* group, fluttering about close to the ground as if about to oviposit, but the attraction proved to be a piece of carnivorous dung. It proceeded to feed, and, noticing some peculiar movements of the abdomen, I got down close to it and watched. Every five seconds or so the tip of the abdomen was bent forward until just above the end of the proboscis and a small jet of liquid ejected on to the surface of the dung, to be quickly absorbed again through the proboscis. This was repeated continuously whilst I watched. Was it, perhaps, to soften its unpleasant meal? "

Professor Carpenter said that Mr. Jackson's explanation was somewhat different

from that which had previously been put forward—viz. to facilitate the absorption of salts from a dry substance, as suggested in the *Proceedings*, **1913**, xl; **1916** (1917), lxxx–lxxxii; **1917** (1918), lxxvii–lxxx; **1923** (1924), lxxxii–lxxxiii; 1930 (1931), **5**: 88.

Meadow-Pipits eating the "Magpie moth," *Abraxas grossulariata* L. By C. M. N. White.

[Communicated by Professor G. D. Hale Carpenter.]

[Professor Carpenter said he had received the following observations from Mr. C. M. N. White of Balliol College, who had visited the island of North Uist in the Hebrides this summer.]

"I visited North Uist at the end of the summer term, primarily to collect some juvenile plumages of certain Passerine birds. On June 25th at Laiaval while walking across the moor about noon one very dull morning with a strong west wind I put up a party of meadow-pipits from a small depression filled by a boggy pool: I obtained one of them.

"The patch of bog was strewn with a large number of wings of 'Magpie' moths (*Abraxas grossulariata* L.), some quite separate, a few still attached to the thorax of the insect. An examination of the stomach of the bird obtained showed it to have eaten at least two of the moths and some other insects, apparently Diptera. The 'Magpie' moths were quite incredibly numerous in this part of the island, and owing to the strong wind were being blown more or less helplessly through the heather. They had apparently got stuck in the water as some were complete insects still alive. I constantly noticed these moths throughout my stay of about ten days.

"Other Lepidoptera encountered were—Large White, fairly numerous in the garden at Newton: Red Admiral, one seen: Meadow Brown, fairly common on the moor area: Common Blue, very common on machair: a large moth like an Oak Eggar noticed flying fast several times: Yellow Shell, very common in heather: a species of Carpet Moth, once noticed. This is not a complete list of Lepidoptera but contains those which I recall on account of their large numbers or familiar appearance: small 'Micro-' moths were very common. I saw no other bird take a butterfly or moth and found no other Lepidopterous remains recognisable as such in any of about thirty other birds' stomachs.

"The stomachs of three other meadow-pipits collected contained caterpillars, and much broken Dipterous fragments and what appeared to be the remains of small spiders. An immature meadow-pipit from the Pennines collected in July 1934 contained only caterpillars and other remains like the Uist birds. Meadow-pipits are very common in the island throughout peat areas."

Professor Carpenter said this interesting observation raised the question of "inedibility," for the "Magpie moth" was a typical example of a distasteful species with warning colours and aposematic habits. So-called "inedibility" must be entirely relative to the presence of other more palatable food in sufficient quantity, and if a sudden outburst occurred when food was much wanted, as by a family of young birds, a species might be devoured during the time of abundance which at other times might be ignored.

Mr. A. J. A. Woodcock, F.R.E.S., has given me the following interesting note on

grossulariata larvae being readily devoured by cuckoos. In May, 1932, gooseberry bushes in a garden at Newburn-on-Tyne, Northumberland, were severely attacked by *grossulariata* larvae. But cuckoos were noticed on May 10th to devour them, and as many as six cuckoos at once came to do so, and continued until larvae and pupae had disappeared. Cuckoos did not visit other neighbouring gardens, which were without gooseberry bushes and none of the other birds in the gardens attacked the *grossulariata*.

This is a nice record of preference shown by the cuckoo for food avoided by the majority of birds.

A new African Machaerotid (Homoptera) inhabiting a calcareous tube. By Professor G. D. Hale Carpenter.

Dr. W. A. Lamborn, F.R.E.S., sent to the Entomological Department of the Oxford University Museum in February some specimens which he discussed as follows in a letter to Sir Edward Poulton who has kindly allowed me to quote it.

"*Fort Johnston, Nyasaland, 6th February*, 1935.

"I have recently succeeded in unravelling what has for long been to me the mystery of the little calcareous tubes such as are to be found, often several side by side and varying greatly in size, coiled round the twigs of a *Bauhinia*. I collected a number of twigs bearing the tubes and kept them in water, and one day discovered a very moist little insect backing out. When it had dried I found that it was an immature bug, and by and by as it rested on the outside of its tube it moulted and I then discovered it to be a Cercopid. . . . From examination of the tubes it is quite easy to draw inferences as to what the larval habit is. The newly-hatched insect inserts its proboscis into the bark, and sucking the juice of the plant passes out like the ordinary froghopper a considerable amount of fluid material superfluous to its needs. In the case of these species, however, the fluid is very rich in mineral matter, which rapidly solidifies and is moulded by the hinder extremity of the insect to form the wall of the tube. One of my specimens shows very prettily the cast larval skin of one insect that happened to come out first solidified by the fluid passed over it by the larva in the tube adjacent. The tubes effervesce very markedly in weak hydrochloric acid but do not dissolve, remaining still hard, so that analysis should prove interesting."

Dr. Lamborn wrote that the similarity of habit between an African species and the Ceylon species noted by Sharp (*Cambridge Nat. Hist., Insects*, **2**: 578) struck him as remarkable.

The 1928, *Nat. Hist. Mag.*, **1**: 76-81, contains an account by Mr. W. E. China of species allied to "Frog-hoppers" which are known to make tubes of this character, from which it appears that they have been recorded from India, the Malay Archipelago, and Australia: Dr. Lamborn's discovery therefore greatly extends the known distribution of this habit. Mr. W. E. China has kindly examined the specimens and finds that they belong to a tribe not previously known from Africa, and has drawn up a description of the new species.

The tubes were submitted to Professor R. A. Peters, F.R.S., of the Department of Biochemistry at Oxford, who kindly reported as follows: "The tubes readily give off carbon dioxide with acid, and consist to the extent of 81·3% of calcium

carbonate. No magnesium is present: the ash is at least 93% CaO. I examined the residue after treatment with acid, and found evidence of protein, but in the amounts which I took no carbohydrate or uric acid. A doubtful phosphate reaction was present."

Dr. Lamborn wrote later, 29th May, 1935: "The plant on which I found them—a species of *Bauhinia*—must be a lime-lover, for at the place where it grows abundantly the Public Works department has a lime-kiln."

A new genus and species of MACHAEROTIDAE (Homoptera) from Nyasaland. By W. E. China, M.A. (Dept. Entomology, British Museum (Nat. Hist.)).

[Communicated by Professor Hale Carpenter.]

The family Machaerotidae Baker is represented in Africa by two genera, *Neuromachaerota* Schmidt with *N. vosseleri* Schmidt, and *N. obscurior* Jac., both from Tanganyika Territory, and *Enderleinia* Schmidt, with *E. bispina* Schmidt, Togo, and *E. fumipennis* Schmidt, Kamerun.

There is also another genus, *Pseudomachaerota* Mel., in Madagascar represented by *P. olivacea* Mel. All these genera belong to the subfamily Hindolinae Baker (= Enderleiniinae Schmidt). The Machaerotinae, and Maxudeinae have so far not been recorded from Africa. The Hindolinae have been divided by Baker into two tribes the Hindolini and the Hindoloidesini (1927, *Philipp. J. Sci.*, **32**: 531–533). The three African and Mascarene genera all belong to the former. It is therefore of some interest to find that the Hindoloidesini are also represented in Africa by a new genus described herewith.

Aphrosiphon gen. n.

Clastopteroid in form, that is the body short and compact with the tegmina apically, behind clavus, bent across apex of body and overlapping. Apex of head broadly rounded on to a strongly convex face. Head including eyes as broad as the anterior margin of pronotum, but no broader, moderately produced in front of eyes, rounded at apex, the frons strongly swollen, smooth and shining. Eyes very large, the vertex broad, obscurely wrinkled; the ocelli nearly twice as far from the eyes as from one another; clypeus short, shaped like an inverted pear, smooth. Rostrum reaching to base of hind coxae. Pronotum six-sided, the anterior margin slightly angularly produced in middle between eyes; antero-lateral margins distinctly shorter than posterior margins, slightly, narrowly reflexed; posterior margin deeply emarginate; disc smooth and shining with some very obscure transverse wrinkles and very fine, very sparse and obscure punctures. No middle keel whatsoever. Scutellum without an erect spinous appendage, triangular, longer than broad, the greater part elevated, with the disc of elevation more or less level, not hollowed out, somewhat wrinkled but smooth; the lateral margins of elevation more or less carinate; the apex of scutellum not elevated, more or less acute, the extreme apex slightly prominent. Tegmina glassy, the veins margined with a row of very fine punctures; apical third of tegmen beyond apex of clavus folded over at right angles, over end of short abdomen; apical membranous appendix large and longitudinally crinkled, resembling the membrane of a Heteropteron; corium with three apical cells and three subapical cells; costal margins somewhat opaque and obscurely finely punctured; the two veins of clavus fused in middle for about one-third their length; clavus broad, its apex truncate, the vein of claval commissure curved round to apex of claval suture; terminal appendix of clavus short and broad. Venation of hind-wings as in

Enderleinia, etc. Hind tibiae with one large spine near middle and one small one half-way between the large spine and the base of tibia. Abdomen short and thick the genital segments vertical, strongly compressed along line of body.

Genotype : *Aphrosiphon bauhiniae* sp. n.

Differs from *Enderleinia* and *Neuromachaerota* in the clastopteroid folding of the apices of tegmina, in the venation of the tegmina, and in the apically blunt clavus. It also differs in the smooth shining feebly wrinkled pronotum, and the more or less level disc of scutellum. Differs from *Hindoloides* Dist., in the strongly elevated scutellum, longer antero-lateral margins of pronotum and distinct venation of tegmina.

Aphrosiphon bauhiniae sp. n.

♀. Sordid yellow, palest on disc of pronotum and scutellum, shading to pale brown in places. The following areas are shining dark brown to black :—Basal half of frons (*i.e.* part visible from above), a stripe between the ocelli, rostrum,

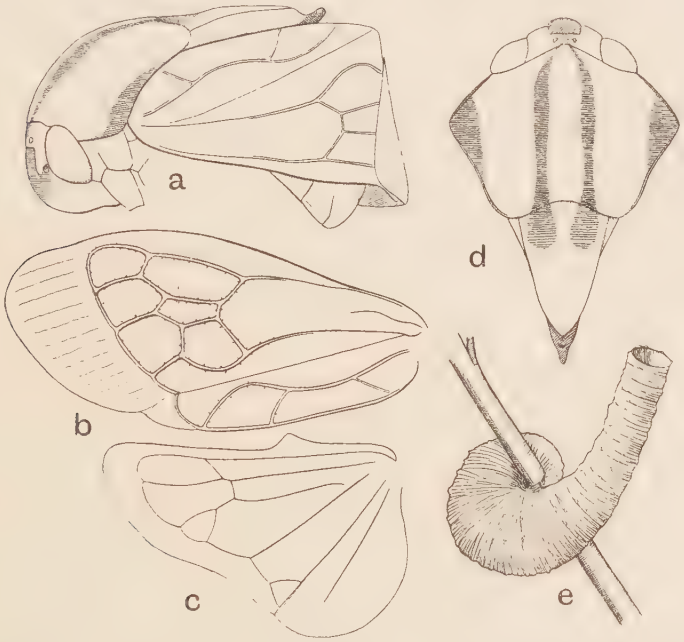

Fig. 1.—*Aphrosiphon bauhiniae* gen. et sp. n. *a.*—lateral view showing folding over of apices of tegmina and elevated scutellum; *b.*—Tegmina flattened to show venation; *c.*—hind-wing; *d.*—dorsal view of head, pronotum and scutellum showing colour pattern; *e.*—larval calcareous tube on *Bauhinia* twig.

two moderately wide longitudinal stripes on pronotum diverging from middle of anterior margin, thence more or less parallel, the lateral angles of pronotum broadly and the postero-lateral margin narrowly, two badly delimited spots at base of scutellum continued from ends of two parallel median stripes on pronotum, mesopleura, anterior lateral angle of metapleuron, bases of femora (rather pale), apical two-thirds of tibiae and genital segments. Tegmina glassy, veins pale brown. Total length 5·5 mm. Width across humeral angles 3·5 mm.

♂ (probably teneral) similar to ♀, but the dark brown markings on frons and

pronotum absent; the base of scutellum largely suffused with brown; the femora and tibiae entirely dark brown to black except for extreme apex of anterior femur. Total length 5 mm. Width across humeral angles 3 mm.

Habitat NYASALAND: Fort Johnson, 3 ♀♀ and 1 ♂.

"On *Bauhinia*" (*W. A. Lamborn*).

The calcareous larval tube is similar to that produced by species of *Machaerota* and *Hindoloides*. It is about 0·4 inches long, placed at right angles to the twig. Its base is greatly thickened and it narrows to the apex.

My thanks are due to Prof. Hale Carpenter for enabling me to study this interesting species.

A record of the first male of *Triglyphus primus* Loew (SYRPHIDAE) taken in Britain. By L. PARMENTER.

On June 30th, 1935, I caught a male *Triglyphus primus* on the glass roof of the verandah of my house at Thornton Heath, Surrey. The only previous record of this species in Great Britain is of a female taken by Capt. C. Diver in July 1929 in Kensington (Aubertin and Diver, 1933, *Ent. Mon. Mag.*, **69**: 188). It appears to be rare in Europe and has been taken in Austria, Denmark and Italy. The life-history of the species is unknown, but the larvae of the allied genera, *Paragus*, *Pipiza* and *Pipizella*, are aphidiphagous.

Wednesday, 20th November, 1935.

Sir Edward Poulton, F.R.S., Hon. Life President, in the Chair.

Elections.

The following were elected Fellows of the Society :—George A. Bisset, Department of Entomology, British Museum (Natural History), Cromwell Road, S.W.7; E. B. Britton, 99, Cornwall Road, Westbourne Park, W.11; K. H. Chapman, The Knowle, Knowles Hill, Newton Abbot, S. Devon; Miss Theresa Clay, B.Sc., 18, Kensington Park Gardens, W.11; Ernest P. Hodgkin, Riverdene, Broxbourne, Herts, *and* The Institute for Medical Research, Kuala Lumpur, Federated Malay States.

Nominations.

The Secretary read the following list of Fellows nominated by the Council as Officers and Council for the ensuing year :—

For President : A. D. Imms, Sc.D., M.A., F.R.S.
For Treasurer : Francis Hemming, C.B.E.
For Secretary : A. W. McKenny-Hughes, D.I.C.

For other members of Council :—R. B. Benson, M.A., Professor P. A. Buxton, M.A., Professor G. D. Hale Carpenter, M.B.E., D.M., C. L. Collenette, Brig.-Gen. B. H. Cooke, C.M.G., C.B.E., D.S.O., H. Willoughby Ellis, H. Eltringham, M.A., D.Sc., F.R.S., G. Fox-Wilson, L. G. Higgins, M.A., F.R.C.S., S. A. Neave, O.B.E., M.A., D.Sc., J. A. Simes, O.B.E., W. H. T. Tams, W. H. Thorpe, M.A., Ph.D., C. B. Williams. M.A., Sc.D.

Exhibits.

The offspring of a pair of the Hawk-moth *Hyloicus pinastri* L., taken in coitu, 15 June, 1934, on a pine-trunk at Gallows Hill, 2–3 miles S. of Bere Regis, near Wareham, Dorset, by H. L. Andrewes. By Sir Edward Poulton.

The larvae were reared partly at Oxford, partly at St. Helens, I.W. There was a remarkable difference in the amount of the shell eaten by the just-hatched caterpillars, in some instances nothing being left except the basal part fixed to the surface on which the eggs had been laid—a more extreme result than any observed in 1933 and recorded in our *Proceedings*, **8** : 129. The change from the green pine-needle-like appearance of the earlier stages to one resembling the rough brown twigs of the pine was far less marked in many of these larvae than in the 1933 family, for the former retained in the fifth stage a considerable amount of the green colouring, detracting greatly from the procryptic effect. Another interesting difference in the 1934 family was the emergence of a male and female in the autumn of the year in which the eggs were laid. They were found when the box was inspected at St. Helens, on 9 Sept., 1934, and may have emerged a day or two earlier, but certainly not more, as shown by their fresh and unworn condition. The emergence was not only surprising because of the date but also because both sexes appeared and not males alone. The emergences in 1935 all took place at Oxford. Returning on

22 June after an absence of five days I found 4 ♂ and 2 ♀ moths in the box, including a pair *in coitu*. The condition of the specimens proved that they had only emerged on that day or on June 21 when the heat wave started. The later emergences were 3 ♂♂ on June 24, 25, and 26 respectively; 1 ♀ on June 28; 3 ♀♀ on June 29. The female found *in coitu* was kept in the hope of obtaining eggs but none was laid.

Although the moths referred to above and exhibited to the meeting show the amount of variation commonly observed in the species there was no marked difference between the 1934 and the 1935 emergences.

A Fossorial Wasp's attempts to find its mud tube after a change in position or the removal of an adjacent conspicuous object. Observed at Tzaneen, N. Transvaal, by Botha de Meillon. By Sir Edward Poulton.

These interesting observations, made by Dr. de Meillon, are described in letters written on the dates recorded at the beginning of each extract.

"22 *March*, 1934.—The following observations may be of interest to you in showing how much topography plays a part in enabling an insect to locate its nest.

"Next to my desk is a table on which stands a wooden box 18 in. × 24 in. and 1½ in. in height. The lid of the box contains 210 holes equidistant from one another and all the same size. I use this box for holding small tubes and keeping them upright. Some of the holes were thus occupied but only along the very edges of the box: near the centre, however, was standing a long pipette and one tube. I noticed that a mason wasp was building her mud-walled nest on the floor of the box near the pipette, and wondered how she managed to find her particular entrance hole in the lid so unerringly. During one of her journeys to collect mud I removed the pipette. The wasp returned and was completely non-plussed. She settled, I must say near the hole, but instead of walking straight to it, she wandered about for several minutes and finally located it. It seems obvious that she had previously been guided by the pipette. On her next journey I turned the box round so that her particular hole was now in a different position. This puzzled her even more than the removal of the pipette, and it was quite a quarter of an hour before she found it. She improved with each succeeding visit and after five of them went to the hole almost immediately. After these valiant efforts I was unwilling to kill her, and therefore her identity remains unknown."

Dr. de Meillon wrote on 24 May, 1934, giving the following additional data:—the diameter of the holes is 0·6 in.; the distance from the bottom of the box to the underside of the lid—1·2 in.; from the highest part of the mud tube to the underside of the lid—0·75 in. The letter also states that "any of the holes around the one in use would have given nearly as direct access to the nest. When hunting for her special entrance the wasp would enter other holes and then withdraw and often came out by some other hole without having found her nest. This was a mud tube and therefore, as you have suggested, the mouth was eventually carried one hole further away. I must admit that all my measurements have been made at a much later date, *i.e.* when the nest was already completed. At the time of my original observation the wasp was only beginning the foundations of her nest, and these had hardly risen above the floor of the box. As I left soon afterwards I cannot tell if she came to use the next hole as an entrance when the nest mouth approached it."

" 7 *Aug.* 1934.—The wasp is a very common long-bodied insect with yellow markings on the legs but, so far as I can remember, none upon the abdomen. I examined the nest while it was being made and can definitely state that it was a longish single tube. She may, however, subsequently have built on to it.

" I have on several occasions seen a very similar insect following the wasp in question. This insect had similar but slightly exaggerated markings on the legs, was almost completely silent in flight and had a long protruding ovipositor. I therefore took it to be a parasitic species possibly parasitising the other, but could never actually see it doing anything suspicious."

" 20 *Sept.* 1934.—I have at last been able to recover a portion of the nest of the wasp, also a larva. You may possibly be able to identify the adult from these. I am sending them under separate cover."

I submitted these materials and the author's description to my friend Mr. R. B. Benson who wrote 12 Nov. 1935 :—

" Yesterday evening I spent some time trying to puzzle out what the wasp could be. Of course you will understand when I say that the description given could equally well apply to a great number of insects, but the most likely is *Rhynchium cyanopterum* Saussure. This is a big, dark-bodied wasp of the *Odynerus* type, with yellow-marked legs, and apparently common in South Africa. It builds mud nests in holes, while most of the other possible wasps make external nests. It is not likely to be a Sphegid, such as *Sceliphron*, because the extraordinarily long and narrow pedicel at the base of the abdomen would surely have been noted by Dr. de Meillon."

My old friend Mr. Oswald H. Latter wrote 17 Nov. 1935 :—

" Botha de Meillon's observation, which I see you are communicating to the R.E.S.L. on Wednesday, reminds me of a similar observation that I made in 1908. So I have turned up the note that I made at the time, and enclose a verbatim copy of it, adding only those words that are enclosed in brackets :—

" ' *Pompilus plumbeus* at Braunton Burrows, Aug. 2, 1908.

" ' Individual observed to hide spider in sand before leaving it to run to hole. Spider always left near some conspicuous object, *e.g.* small tuft of grass, dead reed, etc. Association quite evident, for if (left by) a tuft then other tufts often inspected while searching for right one; also when I moved dead reed (beside which spider had been buried), wasp was bewildered and divided in mind between actual spot (of burial) and place 8 inches off where I had put reed. On replacing reed great excitement ensued, and spider was at once exhumed.'

" The wasp's behaviour, described as ' bewildered and divided in mind,' was as follows :—She ran back from hole to the right place, but on arriving did not begin to dig—she stood still, waving her antennae. Then she started running to and fro round about the spot where the spider was buried, and presently encountered the bit of dead reed; she stopped at the reed for some seconds, but did not dig. Then she several times ran to and fro between the burial spot and the dead reed, and then ran back to her burrow. I replaced the reed during her absence.—O.H.L."

The care in studying the position of the nest and objects near it and the wasp's confusion when these were removed, or even very slightly disturbed, is described in many North American species by G. W. and E. G. Peckham in their very interesting book.* The observations described by Dr. de Meillon are an excellent example of the behaviour of a fossorial wasp in finding its burrow or nest under conditions which lend themselves readily to experimental tests. J. H. Fabre in his experiments, especially on *Bembex rostrata*, proved the same essential importance of the stimulus provided by the entrance door, as described in his delightful style.† I venture to quote the conclusion of his account of the behaviour of the Bembex after he had destroyed the entrance and unroofed the tunnel of her burrow and larval chamber :—

"Such is the connection in acts of instinct; one leading to the next in an order that the most serious circumstances have no power to alter. After all, what was the Bembex seeking? Her larva, evidently. But to reach this larva she had to enter the burrow, and to enter the burrow she had to find the door, and the mother persists in seeking this door while the gallery lay open with provender and larva all before her. . . . Her actions are like a series of echoes, awaking one another in a fixed order, the following one only sounding when the preceding has sounded. Not because there was any obstacle; the burrow was all open, but for want of the usual entrance the first action could not take place. That decides everything; the first echo is mute, and so all the rest are silent. What a gulf between intelligence and instinct! Through the ruins of the shattered dwelling a mother guided by intelligence rushes straight to her son; guided by instinct she stops obstinately where once was the door."

Experiments to test the efficiency of protective adaptations in insects. With 3 plates. By R. Carrick, B.Sc.

[Communicated by Sir Edward Poulton, who showed lantern slides prepared by the author and briefly explained the argument of the paper, especially referring to the new and excellent plan of devising experiments to be carried on in close proximity to nests containing young birds fed by the parents.]

The paper will appear in the *Transactions*.

Earlier descriptions of the Tineid larva *Passalactis tentatrix* Meyr. By Sir Edward Poulton.

I am anxious to call attention to the following papers unfortunately omitted from the account of this inquiline larva on pp. 48–51 of our 1935 *Proceedings* :—

Tragårdh, I., 1907, *Ark. Zool.*, **3** (22) : 1–7, 1 pl.
Silvestri, F., 1920, *Bull. Lab. Zool. Portici.*, **14** : 297–302.

E.B.P. 31 Jan. 1936.

Evidence of preferential feeding by birds in Egypt. By Professor G. D. Hale Carpenter.

Major S. S. Flower, O.B.E., M.B.O.U., has kindly given me the following note. "In the Asyût district of Upper Egypt in January, 1924, each set of beehives

* 1905, *Wasps Social and Solitary*, Boston and New York, Chapter xii, on "Sense of direction" : 275.

† 1901, *Insect Life*, English translation, London : 262–270.

appeared attended by a crowd of Egyptian Swallows *Hirundo rustica savignii* Stephens. Although there were plenty of Little Green Bee-eaters about (*Merops orientalis cleopatra* Nicoll) they were not near the beehives: it appeared that the Swallows, not the Bee-eaters, were the bee-eating birds." Bee-eaters are well known to eat bees at times, but presumably in this particular instance they could obtain other food and in spite of the abundance of bees were not feeding upon them.

Pupae and living adults of *Chionea lutescens* Lundström from Denmark. By F. W. Edwards.

Chionea is a small genus of wingless Tipulidae of which three or four species are known in Europe. The biology of the genus is not well known and even the adults have been met with rather infrequently, most of the records relating to specimens found running over the surface of snow in winter.

C. lutescens has been recorded from Finland and Austria; it was first found in Denmark by Mr. G. P. Kryger during the winter of 1934–35. In November 1934 Mr. Kryger found specimens while digging in his carrots at Gentofte, near Copenhagen, and sent some to the British Museum for determination. Again on the 11th November, 1935, Mr. Kryger was digging up his garden, and found numerous adults and several pupae of *C. lutescens*. On this occasion he at once sent them by air-mail to the British Museum. Most of them survived the journey and were transferred to a jar with soil, dead leaves, and a growing carrot. In this jar their movements were sluggish, but when on the 20th November they were transferred for purposes of exhibition to a glass-topped box half-filled with white plaster of Paris, they became extremely active and mating was observed. Possibly the white background provided a stimulus similar to that of snow. The same activity on a white background was observed on subsequent occasions. The attitude of rest is rather peculiar, all the femora being held erect with their tips nearly touching. Most of the specimens were killed by frost about the 23rd December; one female survived until 12th January 1936, when another sharp frost killed it. Apparently no eggs were laid.

The pupae of *Chionea* were hitherto unknown. Examination of those obtained by Mr. Kryger shows that they closely resemble those of *Cladura* as described and figured by Alexander (1922, *Pomona College J. Ent. Zool.*, **14**: 1–6), thus confirming Alexander's supposition that *Chionea* is derived from *Cladura* or some very similar form. As in *Cladura*, the pupa of *Chionea* has no trace of prothoracic horns, and the cephalic crest is prominent, slightly bifid, with a strong, erect bristle on each side of it; similar bristles occur on the face and pronotum, but the abdominal bristles are much shorter than in *Cladura*; as in *Cladura* the leg-sheaths extend to the sixth abdominal segment. In view of the reduction of the antennae and the loss of wings in the adult stage it is worthy of note that the antennal sheaths are as long as in *Cladura* and that small wing-sheaths are present in the pupa of *Chionea*.

Since the specimens were received at the British Museum Mr. Kryger sent further material to Mr. H. Audcent, together with the following letter regarding the occurrence of *C. lutescens* in Denmark :—

"1. Many years ago my late friend Mr. Klöcker, one day in the fall, put some honeycomb from a deserted beehive on the lawn in his garden. It was only by

chance he put the honeycomb in the grass, he had no intention of trapping insects in the cells. Some days later he went to remove the wax cells when he discovered a number of apterous flies in the cells. He determined the flies as *Chionea araneoides* Schin. (*Faun. Austr.* : 575–6). As Mr. Klöcker was not a fly-collector himself he exchanged all his specimens partly with the Zoological Museum in Copenhagen, partly with some German insect dealers.

" Since that time I have again and again tried to catch *Chionea* in honeycombs in my garden but I have never succeeded. Mr. Klöcker's garden was in the southern outskirts of Copenhagen, mine is in the northern.

" 2. 18 *Nov.* 1934.—I was digging my garden before the winter set in. While picking up carrots from a small plot (2 m. × 1 m.) I saw a curious ' spider ' on the ground. I caught it and found it was the long-searched-for *Chionea*. The plot contained about 70 specimens. They emerged from all sorts of small hollows especially from the tunnels of earthworms. Without doubt the flies are in the daytime subterranean in habit. I have never seen any specimens by daylight, though I am very well aware which insects are to be found in my garden.

" 3. The species. We in Copenhagen do not express an opinion on the species, for since Lundbeck's retirement we have no Dipterist in this town. But my friend Peder Nielsen, librarian in Silkeborg, Jutland, tells me (10.ix.35) : ' I am now able to tell you the name of your *Chionea*. I have borrowed the type of *Chionea lutescens* Lundst. from the Museum in Helsingfors (Finland) and can ascertain that your specimens all belong to this species. Again all specimens from Mr. Klöcker's catch (in the Copenhagen Museum) are in like manner *C. lutescens* Lundst.'

" Many times this fall I looked for *Chionea* in my garden but I have not seen any more.

" 4. To-day (11.xi.35) I tried again with the spade for *Chionea*. In a bare plot (2 m. × 1 m.) where last fall I buried some rubbish from the garden (twigs, leaves, etc., which was all nearly decayed), I found 15 *Chionea*, some pupae and one pupa with larval skin attached. All this material was sent to Dr. Edwards by air-mail. Tell Dr. Edwards not to forget the larval skin in one of the tubes. Perhaps he may use it for purposes of description. It seems that the larvae have been living in the decaying rubbish. One male and one female were *in copula* in the earth. It is then likely that copulation takes place late in the fall, that the imagos die before the winter, while the eggs hibernate. The time for breeding seems to be the middle of November, anyhow I was rather early to-day or I should not have found any pupae. Perhaps we have two broods of *Chionea* here in Denmark, one in summer and one in fall, but I do not know anything about that.

" 16.xi.35. On three evenings in the last week I have been in my garden with a strong searchlight to look for *Chionea*, but I have seen none."

To this Mr. Audcent adds :

(" Here endeth Mr. Kryger's letter, but, as you know, he sent me some *Chionea* dated 17.xi.35, so I presume he found some on the following day, though he does not mention the fact in this letter which was dated 16.xi.35 and despatched on 3.xii.35.)

" I told you that I had received some *Chionea* presumably alive. Alas ! they were all dead, having taken *five* days to reach me by *air-mail*. Oh ! those *Customs* !

" M. Séguy tells me that the French *Chionea araneoides* is found in runs of small mammals."

Occurrence of *Liponeura vogesiaca* Hub. in the Pyrenees, with remarks on the synonymy of some other European species of *Liponeura* (Diptera, BLEPHAROCERIDAE). By F. W. EDWARDS.

Although the family BLEPHAROCERIDAE, and in particular the genus *Liponeura*, is widely distributed in the mountain ranges of Europe, it would seem that no records have hitherto been published regarding the occurrence of members of this family in the Pyrenees.

Attendance at the sixth International Congress of Entomology at Madrid gave me an opportunity of crossing the Pyrenees and incidentally searching for these flies in September 1935, and I was successful in obtaining specimens at two places: near the Port de Siguer above Lo Serrat, Andorra, and below the Port de Siguer in the gorge above Siguer, Arriège. In the former locality a few males were taken on boulders in the stream, and in the latter large numbers of males and a few females were found flying over the stream at the narrowest part of the gorge where it is spanned by a bridge.

Examination of the specimens shows that all are *Liponeura vogesiaca* Hub., the determination being rendered certain by reference to the recent monograph by Mannheims,* a work in which for the first time excellent figures are given of the male genitalia of most of the European BLEPHAROCERIDAE. The male hypopygium of the Pyrenean specimens agrees closely with Mannheims' figures, but there is a small difference in the females; according to Mannheims there is in this sex no basal swelling (epicondyle) on the last tarsal segment, but in Pyrenean females this swelling is almost as pronounced as in the males. Perhaps this may indicate a tendency in *L. vogesiaca*, as in some other species of *Liponeura*, to the production of local races.

L. vogesiaca, first described from the southern Vosges in 1927, has since been found in the Riesengebirge, and it is probable that it has a wide distribution in Europe, having been confused with the allied *L. brevirostris* Lw. The British Museum possesses only a single specimen determined (by Bezzi) as *L. brevirostris*, this being from Rabenau (Saxony), vii.1892. Re-examination of this specimen shows that it also is *L. vogesiaca*, as now fully redescribed by Mannheims.

I take this opportunity of adding some remarks on the synonymy of two other species of the genus *Liponeura*. In 1928 † I recorded *Liponeura decipiens* Bezzi and *L. bischoffi* Edw. from Corsica, the former being determined by comparison with a paratype of Bezzi's, and the latter being a renaming of *L. decipiens minor* Bischoff, the name *minor* being preoccupied; I stated that *L. decipiens* seemed most nearly related to *L. belgica* and *L. bischoffi* to *L. brevirostris*. Subsequently Bischoff ‡ criticised my conclusions, stating that my *L. decipiens* was wrongly determined and was really a variety of *L. belgica* which he renamed *L. belgica edwardsi*, and that

* Mannheims, B. J., 1935, Beiträge zur Biologie und Morphologie der Blepharoceriden (Dipt.), *Zool. Forsch. Leipzig*, **2**.

† Edwards, F. W., 1928, The Nematocerous Diptera of Corsica. *Encycl. ent. Diptera*, **12** : 175–179.

‡ Bischoff, W. C. M., 1930, Neues über paläarktische Blepharoceriden. *Zool. Anz.*, **92** : 9–17.

L. bischoffi was the true *L. decipiens*. Bischoff's views are quoted and apparently accepted by Mannheims. I have, however, no doubt whatever that Bischoff was mistaken; his error was perhaps due to having received from Bezzi a specimen of *vogesiaca* or *brevirostris* which had been accidentally and wrongly labelled *decipiens*. Bischoff evidently did not appreciate the striking differences in coloration between *brevirostris* (or *vogesiaca*) and *decipiens* which are well described by Bezzi in his monograph,* *decipiens* being essentially a yellow species and *brevirostris* a black one. Moreover, the figures of the genitalia given by Bezzi, though very crude, are sufficiently conclusive, as they do represent roughly the appearance of these parts in the *dry* specimens. The Italian and Corsican examples of *decipiens* in the British Museum agree well with Bezzi's description.

Comparison of these Italian and Corsican specimens of *L. decipiens* with Mannheims' figures shows conclusively that Bischoff was correct in regarding them as representing at most a variety or race of *L. belgica*. One might almost go further and say that they are hardly to be distinguished from *L. belgica* as described and figured by Mannheims. The correct synonymy of the three species may therefore be stated as follows :—

1. *Liponeura decipiens* Bezzi 1913, Edwards 1928.
   Syn. *belgica* Bischoff 1924, Mannheims 1935.
   belgica edwardsi Bischoff 1930.
2. *Liponeura vogesiaca* Hubault, 1927, Mannheims 1935.
   Syn. *brevirostris* Bezzi 1913 (? *nec* Loew).
3. *Liponeura bischoffi* Edwards 1928.
   Syn. *decipiens* Bischoff 1924 (*nec* Bezzi); Mannheims 1935.
   decipiens minor Bischoff 1925 (*nec L. cinerascens minor*, Bischoff 1922).

Papers.

The following papers were read :—

" Feeding habits of adult Lepidoptera Heteroneura." By M. J. Norris (Mrs. O. W. Richards).

" Uganda Simuliidae." By E. G. Gibbins.

" Descriptions of three new species of *Drepanosticta* (Odon.) from Philippine Is." By J. Cowley.

" New Mealybugs from East Africa." By H. C. James.

" A revision of the Triplectidinae (Leptoceridae Trichoptera)." By M. E. Mosely.

" The relation of humidity and temperature to the development of three species of African locusts." By A. G. Hamilton.

" Hymenoptera of the New Hebrides and Banks Island." By Miss L. E. Cheesman.

" The study and ecology of Tsetse flies in East Africa." By C. F. M. Swynnerton.

" The contents of the Parts and date of publication of Seitz : *Grossschmetterlinge der Erde*." By Francis J. Griffin.

* Bezzi, M., 1913, Blefaroceridi Italiani. *Bull. Soc. ent. Ital.*, **44** : 1–114.

Wednesday, 4th December, 1935.

Dr. S. A. Neave, O.B.E., President, in the Chair.

The Secretary read for the second time the nominations of the Council for Officers and Council for 1936.

Election.

The following was elected a Fellow of the Society :—Kenneth Smith, A.L.A., 15, Clarence Drive, Horsforth, Near Leeds.

Obituary.

The death of Mr. W. G. Bainbridge, elected a Fellow of the Society in 1933, was announced.

Announcement.

The President made the following announcement regarding the reorganisation of the Society's publications :—

The Council have had under examination the question whether any improvements could be made in the form of the Society's publications and whether they could be published more frequently, and, after careful consideration of the whole question, they have unanimously agreed that the following changes should be made as from the 1st January, 1936 :—

Transactions.

In future each paper accepted for the *Transactions* will be published as a separate part, *i.e.*, in a separate wrapper. Large papers running to, say, 200 or more pages will be published not only as separate parts but as separate volumes. All other papers will be published as part of a single volume, that is to say, they will be consecutively paged.

The Council feel that it would suit some Fellows of the Society equally well if they were to receive only taxonomic papers or only papers relating to other branches of entomology. They therefore propose to invite Fellows to indicate prior to the 31st March each year whether they desire to receive (*a*) all papers published in the *Transactions* or (*b*) only taxonomic papers or (*c*) only papers relating to other branches of entomology.

The Proceedings, Stylops, and the Abstracts.

The Council have agreed to discontinue the publication in their present form of :—

(*a*) The Proceedings;
(*b*) Stylops;
(*c*) The Abstracts of Proceedings.

In place of these publications, the Council have arranged to publish a journal entitled " Proceedings of the Royal Entomological Society " which will in future be published in three series as follows :—

Series A. General subjects.

(*Note :* In this Series it is proposed that all papers (other than taxonomic papers) which have hitherto appeared in the *Proceedings* should in future be published, together with any other short papers dealing with general subjects that may be submitted.)

Series B. Taxonomy (to be published monthly).

(*Note :* It is proposed that this Series should be a direct continuation of *Stylops* and that it should be stated on the title page that this Series incorporates *Stylops*.)

Series C. Journal of Meetings (to be published before each General Meeting of the Society).

(*Note :* It is proposed that under this title should be published the *Abstracts* in their new form.)

Series C will be sent free of charge to all Fellows of the Society in the same way as the *Abstracts* are sent at present.

It is proposed also that copies of both series A and B should also be distributed free of charge to all Fellows of the Society. As from 1937, however, the Council propose that, while Fellows may receive both series A and B, they should be asked to indicate whether they desire to receive both, and, if not, which they desire should no longer be sent to them.

Miscellaneous Questions.

The Council have agreed upon certain general principles to be followed in the editing of all papers submitted for publication in the Society's publications, designed to secure a reasonable degree of uniformity in such questions as the citation of bibliographical references and similar matters.

The Council propose that Fellows of the Society who at present pay a subscription of one guinea only and who are not entitled to receive the *Transactions* shall in future receive the three series of *Proceedings*.

Phenological Records in 1935. By Maj. H. C. Gunton.

England S.E. There has been a very gratifying increase in the number of observers who have contributed records—seventeen in all. *Diagram I* * shows these contributions, the *first date* for each species being enclosed in a rectangle and the *second and third dates* being underlined—the greatest number of early dates come from the Reading district of Berks as shown in the first column. *Diagram II* * shows the first three dates for each species and, with certain exceptions which will be referred to later, it will be seen that these dates indicate a large measure of agreement considering the number of localities involved. *Diagram III* * shows the usual record of the relation between the average dates of first appearance (1919–1934) and the dates of first appearance and the meteorological conditions for 1935. Following a very warm winter (the excess temperature in December having been 7·5° F. and in January 2·5° F.) and warm periods in February, March, April and the beginning of May, there was every inducement for early emergence which at the end of that period amounted to about three weeks. Then came the sudden and extreme

cold period in mid-May driving a wedge between adjacent insects on the list, between observers' dates for the same insect and no doubt between individuals of the same species in the same localities and causing a check back to about the average. After that a practically continuous warm period lasting from mid-June to the end of August caused forwardness which reached fifteen to twenty-five days.

Second brood dates corresponded generally with those of their progenitors.

Reverting to *Diagram II* * further analysis of what took place before, during and after the cold periods seems to emphasise what has been pointed out in the analysis of previous years, namely the extreme sensitiveness of the insects to changes of temperature and their readiness to emerge at the earliest possible date after having been retarded—for the study of which phenomena even the weekly average temperature measure is not alone sufficient.

It will be seen that, referring to the weekly average temperature graph, apparently species 2, 4 and 5 emerged under adverse conditions during the cold spell February 24th–March 17th and species 15 and 18 under still more adverse conditions during the cold spell in May—a reference to the *daily* temperature records shows, however, that at about all these points the *minimum daily temperature* had risen to and above the average.

With regard to the after effects of the exceptionally cold spell in May, while insects which were in the pupa state at its incidence (*e.g.* the Common Blue) responded quickly and their numbers did not show any appreciable reduction, there were indications that those which were in the larval state were affected to a greater extent. That very regular insect, No. 26, the Meadow Brown, was definitely late, while insects the larvae of which feed on the oak in May, such as *Tortrix viridana*, have been reported to have suffered to a considerable extent.

Many species were comparatively scarce, but how far this fact is due to the present season and how far the preceding droughty summers have contributed, it is difficult to say.

An extension of the present phenological scheme is at present being organised with a view to throwing further light on variations in abundance.

Other Districts. Records from observers in other districts are also increasing and now include one in the N.W., one in the N.E., two in the S.W., and one in the Midlands. In the cases of England N.W. and N.E., the records go back for many years and a study which is now being made aims at suitable modifications of the lists to provide alternative species to a few of those in the S.E. list, which are absent, or not sufficiently common, in other districts.

An ascent of Mount Elgon. (Illustrated by lantern slides.) By Dr. F. W. Edwards.

The programme of the British Museum Expedition to East Africa (1934–35) concluded with an ascent of Mount Elgon, which was made from Kitale, on the Kenya side of the mountain, at the end of February, 1935. The arrangements were made by Mr. T. H. E. Jackson, who supplied porters from his farm at Kapretwa and himself accompanied Dr. F. W. Edwards and Dr. G. Taylor in the ascent. Several camps were made, the chief one being at an altitude of about 11,000 ft. in the heath

* Copies of the diagrams referred to, which have not been reproduced, are available for consultation in the Society's Library.

zone. From this camp the two highest points on the crater-rim—Koitoboss and Sosion peaks, each above 14,000 ft.—were reached.

Paper.

The following paper was read :—

"Odonata collected in Japan, with descriptions of three new species." By F. C. Fraser.

ANNUAL MEETING.

Wednesday, 15th January, 1936.

Dr. S. A. Neave, O.B.E., President, in the Chair.

Mr. A. W. McKenny-Hughes, Secretary, read the names of Fellows nominated as Officers and Council for the ensuing year, and announced that they had been duly elected in accordance with the Bye-Laws.

He then read the following :—

Report of the Council, 1935.

It is with pleasure that the Council report the completion of another successful year and the continuation of the Society's efforts to increase the services to its Fellows and to Entomology.

Early in the year the Council gave long consideration to the arrangement of the General Meetings of the Society and decided to initiate the circulation in advance of agenda papers of the meetings. This decision was made in an endeavour to meet the wishes of Fellows resident at a distance from London and anxious to know what subjects would be discussed at a given meeting, and to keep Fellows resident abroad in touch with the Society's affairs at more frequent intervals than is possible by means of the *Proceedings*. Much appreciation of this innovation has been expressed by Fellows and the Council feel satisfied that this decision has filled a long-felt want.

Later in the session the Council gave consideration to the publications as a whole, and set up a committee to report on what changes if any should be made. This committee consisted of Dr. S. A Neave (President), Mr. Francis Hemming (Treasurer), Mr. A. W. McKenny-Hughes (Secretary), Dr. A. D. Imms and Mr. N. D. Riley, and the Council is deeply conscious of the efficient manner in which they carried out their work and grateful for the lucid report they presented. This report was unanimous and was adopted by the Council without change. It provides for the publication of each paper in the *Transactions* as a separate unit; for the publication of long papers as separate volumes of the *Transactions*; for the incorporation of *Stylops* with the *Proceedings*; and for the division of the *Proceedings* into :—

Series A. General Entomology.
Series B. Taxonomic Entomology, being the continuation of *Stylops*.
Series C. Journal of Meetings, being the continuation of the *Abstract of Proceedings*.

In future all the Society's publications will be issued free to Fellows.

The Committee on Generic Nomenclature has submitted a further report, which was published as Part 3 of the *Generic Names of British Insects* on 15th July, 1935. It contains a report by the sub-committee on Neuropteroid groups and a paper by Mr. J. Cowley on the generic names of the British Odonata, with a check list of the species.

Sir Guy Marshall and Mr. Francis Hemming served as the Society's delegates to the Sixth International Congress of Entomology, held on September 6th–12th

at Madrid, and Mr. Francis Hemming and Mr. N. D. Riley at the International Congress of Zoology at Lisbon in the same month.

Dr. Karl Jordan and Professor G. D. Hale Carpenter also acted as delegates to the Tercentenary Celebrations of the Muséum national d'Histoire naturelle, Paris, in June.

During September the Fourth Imperial Entomological Conference was held in the rooms of the Society, and on 25th September a conversazione was given by the Society to enable Fellows to meet delegates to the Conference. Exhibits were on view in the Library and Meeting Room, for the arrangement of which the Council is largely indebted to Mr. C. L. Collenette.

In February it was brought to the notice of the Council that the surviving MSS. and original drawings of Jacob Hübner were for disposal. At their request the Registrar made a report on these and brought them to London for inspection. Mr. R. W. Lloyd very generously defrayed the cost of this purchase and thus secured for the Society a magnificent addition to the Library, which has now the finest collection of Hübner's works in the world.

Since the last Annual Meeting 18 (11) Fellows have died, or their deaths have been ascertained (the numbers in brackets in this and the following paragraphs indicate the corresponding figures for the previous year):—R. Adkin, K. F. Armstrong, E. B. Ashby, W. G. Bainbridge, W. Benham, W. G. Clutten, F. A. Dixey, E. Goodwin, G. H. Gurney, H. C. Hayward, G. B. Kershaw, P. Martin, W. Ormiston, A. L. Rayward, C. E. Stott, A. H. Swinton, J. D. Ward, and A. P. Wickham.

The following 13 (5) Fellows have resigned:—R. R. Armstrong, the Rev. M. T. Beckett, H. J. Craufurd-Benson, H. J. Falkner, Wyndham Forbes, W. Junk, Major F. Moysey, R. W. Paine, Miss E. K. Pearce, J. S. Phillips, A. Smith, A. C. Théry, and A. E. Tonge.

The following 6 (5) have been removed from the list of Fellows in accordance with the Bye-Laws, Chapter XVI, Section 3:—H. O. Francis, J. D. Gunder, G. D. Irving, A. W. J. Pomeroy, J. R. Shaw, and R. B. Tweedie.

During the year 39 (31) Ordinary Fellows have been elected, of whom 29 have completed their obligation. This does not compensate for the losses during the year, and the total result is a slight decrease in the number of Fellows. The Society now consists of 12 Honorary Fellows, 6 Special Life Fellows and 673 Ordinary Fellows, a total of 691.

The meetings continue to be well attended, the average number of Fellows and Visitors at each being 67, an increase of 7 on the previous year.

The *Transactions* for 1935 was published in four parts on 27th June, 28th November, 20th December and 30th December respectively. The volume comprises 18 papers by 16 authors. Of these, 5 deal with Hymenoptera, 4 with Lepidoptera, 2 with Coleoptera, 2 with sense organs of insects, 1 with Hemiptera, 1 with Trichoptera, 1 with Thysanoptera, 1 with the times of activity of nocturnal insects and 1 with nesting associations of insects with birds.

The volume consists of 573 pages and is illustrated with 16 plates, and is thus well up to the average. Financial assistance has again been forthcoming from various sources.

The volume of *Proceedings* will consist of about 130 pages, illustrated by 2

plates, and several text-figures, the cost of the plates being defrayed by Mr. Hugh Main and Professor Hale Carpenter.

The fourth and last volume of *Stylops* in its present form consists of 282 pages and is illustrated by numerous text-figures. It comprises 66 papers by 52 authors. Of these 25 deal with Coleoptera, 11 with Diptera, 9 with Hemiptera, 9 with Lepidoptera, 4 with Orthoptera, 4 with Hymenoptera, 3 with Thysanoptera and 1 with Psocoptera. The Imperial Institute of Entomology paid part of the cost of Dr. Duda's paper.

It is worthy of record that 250 papers appeared in the four volumes of *Stylops* published by the Society.

Much of the detailed work of the Society's business has been carried out by a Finance and Housing Committee, under the Chairmanship of Brigadier W. H. Evans, a Publication Committee under that of Dr. A. D. Imms, and a Library Committee under that of Dr. K. Jordan, and the thanks of the Council are again due to those Fellows who have served on these Committees.

The Library, both as to its organisation and to its contents, has continued to make good progress during the year.

The use of the Library by Fellows has continued to be very satisfactory, the number who have borrowed books being 354, and the number of books borrowed being 883. In addition 40 books were lent to the National Central Library.

The Honorary Secretary of the Committee for the Protection of British Insects reports that the Joint Sub-committee visited Wicken Fen on 4th May to inspect the result of the cutting which had been carried out the previous summer. It was found to be satisfactory.

The representatives of the Society also attended the Annual Meeting of the Executive Committee of Wicken Fen, held at Cambridge on 19th June. At this meeting it was decided that a further eight acres should be cleared and placed at the disposal of the Joint Entomological Committee and that another eight acres in Verrall's Fen should be converted into a " litter " area during this winter, should funds be available.

The Society for the Promotion of Nature Reserves has continued the clearing of Wood Walton Fen, which suffered rather more from the drought than did Wicken Fen. A system of cross dykes has been cut through the centre of a portion of the Fen.

The Committee has received a very generous gift of a motor-driven pump from Captain E. B. Purefoy. This will enable the water level in the dykes to be kept higher during the summer months.

Lycaena dispar batavus did well at both Wood Walton and Wicken Fens.

Maculinea arion appeared in fair numbers in N. Cornwall. It is to be regretted that, in spite of the Society's appeal to entomologists to refrain from taking this butterfly, a considerable number of collectors visited the district during the year. The Committee again contributed towards the cost of the sanctuary for this butterfly.

The Committee are endeavouring to arrange for an area on the South-East Coast which is in danger of being developed for building to be scheduled as a place of scientific interest.

The Committee would welcome information from Fellows as to any insects or localities which are in need of protection. During the year the usual close co-operation with the National Trust and the Society for the promotion of Nature Reserves has continued.

The Report was adopted on the motion of Mr. H. Willoughby Ellis, seconded by Mr. J. E. Collin.

Mr. Francis Hemming, Treasurer, then read the following :—

Treasurer's Report.

In my report last January on the financial position of the Society for the year 1934, I observed that the two most important items in the income account of a Society such as ours are those in respect of annual contributions and sales of publications. I expressed the view also that, of these items, the former is, over a long period, the best index of the Society's prosperity, while the latter reflects more quickly the trend of business activity.

It is satisfactory, therefore, to find that the year 1935, which was a year of improving trade activity, witnessed an increase of no less than £373 in the receipts on account of sales of publications. This increase is in part attributable to an increased expenditure by the Society on its publications during the year, but is in part due also to improved conditions generally which have led to an increase in the actual volume of sales secured. We may, therefore, claim that the Society is taking its share in the increase of general prosperity which has marked the last twelve months.

Turning to the item in the accounts in respect of annual contributions we find that in 1935 these amounted approximately to £1340 as compared with approximately £1309 in 1934, an increase of £31. Though this increase is not large, we may, I think, regard the position as satisfactory, for a substantially larger increase would have been secured, if we had not been exceptionally unfortunate last year in losses in our numbers through the deaths of Fellows and for other causes. If the Society is to continue to progress, it is essential that its membership should show no decline. Individual Fellows can do much to help the Society in this respect by bringing the work of the Society to the notice of entomologists who are not at present Fellows and by proposing them for Fellowship.

Turning to the expenditure side of the account, there is little to which special attention need be called. By careful administration it has been possible to secure a slight reduction in " House Expenses " and to limit severely the natural tendency of " Office Expenses " to expand. The customary contribution of £80 was made under the former heading to the Repairs to Premises Account. Such increase as has occurred under the latter head is due to the normal increment in the salaries of the staff.

The allocation to the Library in 1935 amounted to £156, an increase of £10 on the amount so allocated in the previous year.

In 1935 the gross expenditure on the *Transactions* and *Proceedings* amounted to £990 as compared with £688 in 1934, an increase of £302. Donations towards the cost of papers published in these journals amounted approximately to £125 as compared with £95 in the previous year. The largest individual contribution received on this account was £70 paid by the Royal Society towards the cost of

Professor Hale Carpenter's paper on the Rhopalocera of Abyssinia, which was issued as a separate part (part 3) of the *Transactions* last month. Thus the net expenditure on the production of these journals in 1935 amounted to approximately £912, as compared with £509 in 1934, an increase of £403. A small part of this increase represents the cost of printing and distributing the *Abstracts of Proceedings*, which were started in October last. In accordance with the scheme for the reorganisation of the Society's publications, announced by the President at the General Meeting held on the 4th December last, these Abstracts will in future be issued as Series C of the *Proceedings*.

The gross cost of the journal *Stylops* was £322 in 1935, which is within a few shillings of the sum expended on this account in 1934. Subscriptions and sales amounted to approximately £136 and donations to approximately £5. The corresponding figures for 1934 were approximately £103 and £19 respectively. Thus there was in 1935 a further reduction of approximately £20 in the net cost to the Society of producing this journal. Under the scheme of reorganisation to which I have already referred, *Stylops* will in future be issued as Series B of the *Proceedings*.

In the year just closed the Income and Expenditure Account shows an excess of income over expenditure amounting to £169 8*s*. 6*d*., as compared with £3 10*s*. 7*d*. in 1934.

Part 3 of the *Generic Names of British Insects* dealing with the British Odonata was issued last year, its cost (amounting to approximately £26) being defrayed from the "Meldola Bequest Fund" in accordance with the scheme announced in my report last year.

The Library fund has been especially fortunate in the last twelve months. In the early part of last year Mr. R. W. Lloyd most generously presented to this fund the sum of £150. This gift made it possible for the Society to acquire the unique collection of printed works and manuscripts by the great German entomologist, Jacob Hübner, and his successor, Carl Geyer, which was announced by the President at the General Meeting held on the 6th March, 1935, and of which I then gave a brief preliminary account. To the Library Fund also has been credited the sum of £100 which during the year the Society received as a legacy from its Fellow, the late Mr. C. B. Holman-Hunt.

Later in the year the Society received a legacy of £250 bequeathed to them free of all conditions under the will of the late Mr. Robert Adkin, a former Vice-President of the Society and one of its Fellows since 1885. The Council have for the time being allocated this sum to General Reserve.

The Balance Sheet itself calls for no special comment.

It will be seen from the foregoing report that during the year 1935 the Society has been able to maintain its varied activities on the same level as in 1934 and in the amount of publications issued to exceed the level reached in that year. It has also been possible to secure for the first time for a number of years a substantial excess of income over expenditure. From the financial standpoint, the Society may, therefore, be well pleased with the year 1935.

The Report and Accounts were adopted on the motion of Dr. C. B. Williams, seconded by Mr. H. M. Edelsten.

The President then read his Address, and at its conclusion a vote of thanks

to him, coupled with the request that it might be printed in the *Proceedings*, was moved by Dr. K. Jordan, and carried unanimously.

A vote of thanks to the Officers for their services during the year was then passed on the motion of Prof. G. D. Hale Carpenter, seconded by Mr. R. W. Lloyd and carried unanimously. Mr. Francis Hemming and Mr. A. W. McKenny-Hughes briefly replied.

Presentation to Dr. S. A. Neave.

Mr. Francis Hemming, Treasurer, said :—

Before this meeting is adjourned, there is one further item on the agenda which it falls to my lot to move. It is concerned with a presentation to our President—Dr. Sheffield Airey Neave.

There are many Fellows present here to-night who could speak out of a longer personal experience of the services rendered to the Society by Dr. Neave, though, as Treasurer since 1929, I have had the advantage of working in close and daily collaboration with Dr. Neave. I have, however, another qualification to speak in your name to Dr. Neave this evening. It was seventeen years ago, in 1919, that I was elected a Fellow of this Society. In those days, as the older Fellows of the Society will recall, we had as a Society no home of our own; we were but lodgers in the house in Chandos Street of the Medical Society of London. As a body, the Society had emerged with reduced numbers, it is true, from the ordeal of the war, but with its energy and its enthusiasm unabated. It was a critical moment in its history. How was it going to develop? At that moment there was a young man who had already served three years on the Council, who, possessed of a scientific training, had already had extensive experience of entomological work in the field and who was the second in command of what was then the Imperial Bureau of Entomology. This was the man who, in a moment of good fortune, the Council nominated as one of the Secretaries of the Society. The young man of 1919 is the President of January, 1936.

For fifteen years, from 1919 to 1933, Dr. Neave has served the Society, first as Joint Secretary and later as its sole Secretary. For the last two years he has been our President.

It is not necessary to recall this evening the remarkable development which has taken place in every department of the life of the Society in the last seventeen years. Many Fellows have contributed to secure the astounding progress which has marked these years, but no one Fellow has played a larger part in the life of the Society during this period than has Dr. Neave.

It is, therefore, fitting and right that on this evening, the last on which Dr. Neave will preside over us as our President, we should gather together at once to express our gratitude to him for the great services which he has rendered to the Society, and to mark the affectionate regard in which he is held by us, his friends and colleagues.

Dr. Neave, Fellows and other friends of the Society have joined together to make a presentation to you on your vacating the presidential chair to-night after twenty years' continuous service on the Council, seventeen of which you have served as one of the Officers of the Society. We are sincerely grateful to you for the active and vigorous part which you have played in the development of our

corporate life during this period. Though we are to-night saying good-bye to you as one of our officers, we are glad to think that you will be with us on the Council for another year, and that thereafter you will be very close at hand in the Imperial Institute of Entomology. You may be sure that in the future, as in the past, we shall not fail, when the need arises, to seek your counsel and advice on questions of special moment to the Society. We in this Society are the losers by your ceasing to be one of our officers, but we realise that what is our loss is the gain to zoology at large. It is difficult in the realm of systematics to think of a work of greater practical value to students of every branch of zoology than will be the next *Nomenclator Zoologicus* of which the Zoological Society of London has appointed you Editor-in-Chief. We can well imagine the innumerable problems which face you in this great task. We who know you do not doubt that they will be overcome in the same way as were the difficulties which from time to time confronted you when you were the Secretary of the Society.

We wish all good fortune in the future both to you and to Mrs. Neave, who during your Presidency has so kindly acted as hostess at our evening receptions. We very much regret that through illness she is not able to be with us this evening. We ask you to accept a portrait of yourself which we have arranged should be painted. The portrait is not available this evening, but it will, we hope, not be very long before it is completed. In the meanwhile, I hold in my hand this book containing the signatures of those who have combined to make this presentation to you. This book, Dr. Neave, I have great pleasure in presenting to you in the name of, and by the authority of, the Fellows and other friends of the Royal Entomological Society of London.

Mr. R. W. Lloyd said :—

Speaking as one of the senior Fellows of the Society and on their behalf, it gives me great pleasure to associate myself and them with what the last speaker has said.

I have sat under a great many Presidents—25 I believe—the earliest being the late J. W. Dunning in 1884, and out of all these the names of four spring to my mind as those to whom the Society is especially indebted—J. W. Dunning, Professor Westwood, our dear old friend Poulton, and last—Dr. Neave.

All these men have done much for the Society. No one, however, had to lead its affairs through such difficult times, not so much inside but outside the Society, as our present President. He can, on quitting the chair to-night, feel that the Society never was more prosperous nor stood so high in the eyes of the world as it does to-day.

We hope that, though we lose him as President to-night, we shall, as he is still a young man, have the benefit of his experience and advice in the affairs of the Society for many years to come.

Dr. Neave said in reply :—

I am sure you will all agree that this is an occasion that would test the powers of even the most experienced makers of speeches, which is the last thing that I profess to be. When I was informed as to what was to happen at the end of this meeting, I contemplated preparing a brief speech. This would have necessarily been of a somewhat formal character, and I think that you would prefer me to say more spontaneously how very deeply I appreciate this generous recognition of any services that I have been able to render to our Society.

May I say, too, that the idea that these services should have been worthy of such recognition has, if possible, given me even greater pleasure than the gift itself.

While I am most grateful for the kind remarks of our Treasurer and of Mr. Lloyd, I feel that there is an element of exaggeration about them that would have been somewhat out of place if this had been one of our scientific meetings! During the considerable number of years that I had the honour of being your Secretary, I think that my functions might have been more correctly described as those of a liaison officer between the many able and generous Fellows of the Society who were all united in the common object of promoting its advancement.

In conclusion may I repeat, both on behalf of myself and my wife, who to her great regret is not well enough to be here to-night, how very deeply grateful I am to all those of my friends who have participated in this generous gift which will be a permanent source of enjoyment to us both for the rest of our lives.

THE ROYAL ENTOMOLOGICAL SOCIETY OF LONDON.

TREASURER'S STATEMENT OF INCOME AND EXPENDITURE for the Year ended December 31st, 1935.

(Presented at the Annual Meeting, 15th January, 1936.)

GENERAL FUND.

INCOME.

1934.			£	s.	d.	£	s.	d.
£	£							
		To subscriptions—						
42		received in advance for 1935 ...	46	2	6			
1,200		received in 1935 for 1935	1,240	18	3			
57		received in 1935 for previous years	73	9	0			
1,299			1,360	9	9			
75		*Less* subscriptions in arrear at 31st December, 1934—valued at ...	85	0	0			
1,224			1,275	9	9			
85		*Add* subscriptions in arrear at 31st December, 1935—valued at ...	65	0	0			
1,309						1,340	9	9
85		,, admission fees				88	4	0
		,, publications—						
414		sales	787	0	0			
95		donations towards cost	124	19	0			
509						911	19	0
55		,, dividends on investments (gross) ...				55	2	8
250		,, rents from sub-tenants				250	0	0
236		,, contributions by sub-tenants towards house expenses				250	4	0
8		,, Hire of Room				10	5	0
—		,, donation				5	0	0
—		,, bequest—the late R. Adkin, Esq. ...				250	0	0
5		,, miscellaneous				6	7	5
£2,457						£3,167	11	10

EXPENDITURE.

1934.			£	s.	d.	£	s.	d.
£	£							
		By House expenses—						
226		wages	224	17	0			
92		fuel, gas and electric light	94	4	0			
34		insurance and water	34	9	8			
80		repairs fund—transfer	80	0	0			
34		miscellaneous	31	3	10			
466						464	14	6
		,, office—						
674		salaries	701	3	8			
82		printing and stationery	58	5	6			
33		postages	34	4	5			
21		audit fee	21	0	0			
	25	superannuation ... 25 5 6						
		less employees' contributions 12 0 0						
	12							
	13		13	5	6			
37		furniture	2	10	0			
58		miscellaneous	102	14	9			
918						933	3	10
		,, library—						
146		library fund transfer	156	3	6			
10		furniture		—				
156						156	3	6
688		,, cost of publications				990	2	1
322		,, "Stylops" cost of printing, &c. ...	321	5	5			
	103	*less* subscriptions and sales 136 11 8						
	122 19	donations ... 5 14 4						
200			142	6	0	178	19	5
25		,, donation to Zoological Record ...				25	0	0
—		,, transfer to general reserve				250	0	0
4		,, excess of income over expenditure carried to Balance Sheet				169	8	6
£2,457						£3,167	11	10

STATEMENT OF INCOME AND EXPENDITURE for the Year ended December 31st, 1935.

WESTWOOD BEQUEST FUND.

1934.	Income.	£ s. d.	1934.	Expenditure.	£ s. d.
£ 7	To interest on Birmingham Stock	7 3 8	£ 7	By income for the year, carried to Balance Sheet	7 3 8

HAMILTON DRUCE BEQUEST FUND.

1934.		£ s. d.	1934.		£ s. d.
£ 44	To interest on New Zealand Stock	43 16 6	£ 44	By transfer to Library Fund	43 16 6

LIBRARY FUND.

1934.		£ s. d.	£ s. d.	1934.		£ s. d.	£ s. d.
£ 44	To transfer from Hamilton Druce Bequest Fund—interest on New Zealand Stock	43 16 6		£ 131	By expenditure on new books	325 13 11	
146	,, transfer from General Fund	156 3 6		44	,, binding, repairs and insurance	50 2 9	
—	,, donation by R. W. Lloyd, Esq.	150 0 0		175	—		375 16 8
—	,, bequest—the late C. B. Holman-Hunt, Esq.	100 0 0			,, excess of income over expenditure carried to Balance		
3	,, miscellaneous	9 0		18	Sheet		74 12 4
193	—		450 9 0				
£193			£450 9 0	£193			£450 9 0

REPAIRS TO PREMISES FUND.

1934.		£ s. d.	1934.		£ s. d.
£ 80	To transfer from General Fund	80 0 0	£ 168	By expenditure on repairs	5 7 6
	,, excess of expenditure over income, carried to Balance			,, excess of income over expenditure, carried to Balance	
88	Sheet	— —	—	Sheet	74 12 6
£168		£80 0 0	£168		£80 0 0

MELDOLA BEQUEST FUND.

1934.		£ s. d.	£ s. d.	1934.		£ s. d.
£ 4	To sales	4 9 5		£ 66	By expenditure on "Generic Names of British Insects" Part 3	25 19 7
2	,, interest on deposit	2 5 0				
6	—		6 14 5			
	,, excess of expenditure over income carried to					
60	Balance Sheet		19 5 2			
£66			£25 19 7	£66		£25 19 7

BALANCE SHEET, December 31st, 1935.

GENERAL FUND.

Liabilities.	£ s. d.	£ s. d.	Assets.	£ s. d.	£ s. d.
To sundry creditors	605 12 7		By sundry debtors—		
,, subscriptions in advance	46 3 0		subscriptions valued at	65 0 0	
		651 15 7	admission fees	34 13 0	
,, excess of assets over liabilities :			publication sales	354 18 1	
at 31st December, 1934	35 12 7		rent and contributions to house expenses	252 10 9	
Add excess of income over expenditure for year to date	169 8 6		income tax recoverable	8 1 10	
		205 1 1	sundries	17 12 10	
					732 16 6
			,, payments in advance		12 12 9
			,, unsold copies of publications	(Not valued)	—
			,, cash at Bank : current account	84 8 10	
			,, cash in hand	26 18 7	
					111 7 5
		£856 16 8			£856 16 8

WESTWOOD BEQUEST FUND.

	£ s. d.	£ s. d.		£ s. d.
To excess of assets over liabilities as at 31st December, 1934	257 3 8		By £239 12*s.* 4*d.* Birmingham Corporation 3% Stock 1947	
Add income from investment for year to date ...	7 3 8		at cost	250 0 0
		264 7 4	(value at date £230 0*s.* 8*d.*)	
			,, cash at Bank	14 7 4
		£264 7 4		£264 7 4

HAMILTON DRUCE BEQUEST FUND.

	£ s. d.		£ s. d.
To excess of assets over liabilities as at 31st December, 1934	1,000 0 0	By £1,095 15*s.* 6*d.* New Zealand 4% Stock 1943/1963 at cost	1,000 0 0
	£1,000 0 0	(value at date £1,145 1*s.* 7*d.*)	£1,000 0 0

LIBRARY FUND.

	£ s. d.	£ s. d.		£ s. d.	£ s. d.
To sundry creditors		16 0	By library furniture and fittings	(Not valued)	
,, excess of assets over liabilities—excess of income over expenditure for year to date	74 12 4		,, library books (valued at £10,000)		
Less excess of liabilities over assets at 31st December, 1934	10 14 7		,, income tax recoverable		4 18 7
		63 17 9	,, cash at Bank		59 15 2
		£64 13 9			£64 13 9

BALANCE SHEET, December 31st, 1935.

REPAIRS TO PREMISES FUND.

Liabilities.	£ s. d.	£ s. d.	Assets.	£ s. d.
To sundry creditors	... ...	18 6	By cash at Bank	102 0 3
,, excess of assets over liabilities as at 31st December, 1934	26 9 3			
Add excess of income over expenditure for year to date	74 12 6			
		101 1 9		
		£102 0 3		£102 0 3

HOUSING FUND.

	£ s. d.		£ s. d.	£ s. d.
To excess of assets over liabilities as at 31st December, 1934 ...	£13,417 3 4	By freehold premises, 41, Queen's Gate, at cost	6,250 0 0	
		,, cost of New Meeting Room Scheme	7,167 3 4	
				13,417 3 4
	£13,417 3 4			£13,417 3 4

COMPOUNDING FUND.

	£ s. d.		£ s. d.
To excess of assets over liabilities as at 31st December, 1934 (representing estimated liability of Fund at 6th March 1934—subject to valuation quinquennially.)	900 0 0	By £1,094 4*s.* 5*d.* 2½% Consols valued at 6th March, 1934 (value at 31st December, 1935, £946 9*s.* 11*d.*)	900 0 0
	£900 0 0		£900 0 0

GENERAL RESERVE.

	£ s. d.	£ s. d.		£ s. d.	£ s. d.
To excess of assets over liabilities as at 31st December, 1934	805 2 5		By £259 17*s.* 9*d.* 2½% Consols valued at 6th March, 1934 ...	213 14 11	
Add transfer from income and expenditure account —general fund	250 0 0		,, £532 3*s.* 5*d.* 4% Consols valued at 6th March, 1934 ... (value at 31st December, 1935, £834 2*s.* 11*d.*)	591 7 6	805 2 5
(Bequest by the late R. Adkin, Esq.)		1,055 2 5	,, cash at bank: deposit account	79 11 1	
			current account	170 8 11	
					250 0 0
		£1,055 2 5			£1,055 2 5

MELDOLA BEQUEST FUND.

	£ s. d.	£ s. d.		£ s. d.
To excess of assets over liabilities as at 31st December, 1934	390 7 0		By sundry debtors	12 11
Less excess of expenditure over income for year to date	19 5 2		,, cash on deposit at Bank	370 8 11
		371 1 10	,, unsold copies of "The Generic Names of British Insects" (not valued)	
		£371 1 10		£371 1 10

(Signed) FRANCIS HEMMING, *Treasurer.*

We have audited the above Balance Sheet and Accounts with the Books and Vouchers of the Society and certify them to be correct. The Solicitors have certified to us that they hold the deeds of 41, Queen's Gate for safe custody on behalf of the Society, and we have verified the Investments and Bank Balances.

23, *Queen Victoria Street,*
London, E.C. 4.
8th January, 1936.

(Signed) W. B. KEEN & Co., *Chartered Accountants.*

COMMITTEE FOR THE PROTECTION OF BRITISH INSECTS.

RECEIPTS AND PAYMENTS ACCOUNT for the year ended 31st December, 1935.

RECEIPTS.	£	s.	d.	PAYMENTS.	£	s.	d.
To balance 1st January, 1935	17	17	4	By expenditure on preservation of *M. arion* and *L. dispar*	36	0	0
„ donations	34	1	6	„ balance 31st December, 1935: at Bank	15	18	10
	£51	18	10		£51	18	10

(Signed) FRANCIS HEMMING, *Treasurer.*

We have audited the above Account of Receipts and Payments and certify same to be correct. We have verified the balance at the Bank.

(Signed) W. B. KEEN & Co., *Chartered Accountants.*

23 *Queen Victoria Street,*
London, E.C.4.
8th January, 1936.

THE PRESIDENT'S ADDRESS.

Ladies and Gentlemen,

Another year has passed, and we have again to congratulate ourselves that our Society flourishes exceedingly, thanks to the labours of our Council under the guidance of our Honorary Officers and the assistance of our Registrar. The details of its progress have already been described to you in the Council's Report. Among the more important decisions of that body has been the considerable change in the form of its publications that it is proposed shall come into effect in 1936. This decision is the result of a very close examination of the problem, and the details have been very carefully considered. It is therefore to be hoped that they will meet with general approval. We may also congratulate ourselves on being one of the Societies that will shortly benefit under the will of the late Herbert Spencer, owing to the trust created at his death being about to be wound up.

During the course of the year we have had to mourn the loss of no less than seventeen Fellows, including three of the oldest and most distinguished of them.

By the death of Robert Adkin, we have lost not only a great friend who had been a constant attendant at our meetings for more years than most of us can remember, but who was also a great and generous benefactor to the Society. He died at the age of eighty-six at his home at Eastbourne, where he had so constantly entertained his many entomological friends.

He joined the Society in 1885, served for four periods on the Council, and was Vice-President in 1922 and 1928. Though invited to stand for President on more than one occasion, he could not be persuaded to accept this honour.

Though his interests in Natural History were wide, the British Lepidoptera attracted his chief attention, and he formed an important collection of them. The list of his benefactions to this Society is a lengthy one. He assisted more than any other single Fellow (apart from bequests) towards overcoming the financial difficulties arising out of the purchase of this building. He not only contributed £50 towards the fund, but took up £200 of the debentures, all of which he generously cancelled as they became due for repayment. He also presented to the Society our epidiascope and lantern screen when the new meeting room was built. Not content with this, he made a bequest of £250 to the Society, as well as a selection of the books from his fine library, a long list of which will appear in the next published list of library accessions.

Our Society has sustained another particularly severe loss in the death of Frederick Augustus Dixey, who died in St. George's Hospital in his eightieth year,

as the result of an accident, on the very day that our Annual Meeting was held last year. Though best known to most of us as an entomologist with a profound knowledge of the Pierine butterflies, Dixey was also a man of very wide attainments and interests. A scholar of Wadham College, Oxford, he was closely associated with his College for the greater part of his long life. After a brief interval, from 1880–1883, during which he was Demonstrator of Physiology at University College, London, he returned to Oxford and was elected to the Wills Medical Fellowship at Wadham, where he successively held the offices of Junior Bursar, Bursar and Sub-Warden. He joined the Society in 1887, was President in 1909–10, Vice-President in 1904, 1905 and 1911 and served on the Council in 1895 and from 1904–1906. He was elected a Fellow of the Royal Society in 1910. To one who, like myself, has many pleasant memories of being Dixey's guest at Wadham at intervals during more than thirty years, his death has left a great sense of personal loss.

Edward Goodwin, who died at his home, Canon Court, Wateringbury, Kent, at the end of last year at the age of sixty-seven, was a keen naturalist, with special interests in Entomology. A large and successful grower of hops, he made a study of the insect pests of this crop and was also very successful in breeding many of the rarer British Lepidoptera. He had been a Fellow since 1904.

Harold Carlyle Hayward, who had been a Master at Repton for more than thirty years, died on 13th April last at the comparatively early age of fifty-nine. He was specially interested in the Lepidoptera, particularly in the Tortricidae, of which he made a large collection. Among his publications is a very complete list of the Lepidoptera of Derbyshire, published in 1926. He became a Fellow of our Society in 1919.

Paul Martin, of Lima, Peru, who had only become a Fellow of the Society this year, was a German veterinary surgeon, who had lived in Peru for more than twenty years. He had made an extensive study of the insects of that country, particularly the Rhopalocera.

Arthur Leslie Rayward, who died in October last in his sixty-ninth year, joined the Society in 1907. Though the state of his health seldom permitted him to attend our meetings, some of us had the opportunity of making his acquaintance at Eastbourne at the house of his friend, Robert Adkin, whom he only survived a few months. He was a keen naturalist and skilled microscopist, with a special interest in the Lepidoptera.

Charles Ernest Stott, who joined the Society in 1915, died on 18th September after a long illness at the age of sixty-seven. He was a well known authority on the British Coleoptera and published many notes on this Order.

Archibald Henry Swinton, who died at Braishfield, Hampshire, aged ninety-one, was the senior Fellow of the Society, having been elected a Member (as the Fellows were called prior to the granting of the Charter) so long ago as 1876. As a

young man he served in the army for a short time and was stationed in Mauritius, but was invalided home and entered an architect's office. Ill health having again forced him to retire, he devoted his long life to his hobby of Entomology. Some of his original researches include the discovery of auditory organs in the cicadas, and his most important publication was entitled " Insect variety : its Propagation and Distribution."

Prebendary Archdale Palmer Wickham, Vicar of East Brent, who died in October last within a month of his eightieth birthday, was well known to many of us. He was a scholar of Marlborough, where he was Captain of the School, and also of New College, Oxford. He was a famous cricketer in his day, and he played for the Gentlemen *v.* the Players on three occasions. He joined our Society in 1917 and was a keen student of the Lepidoptera, especially in recent years of the Micro-lepidoptera, of which he made a large collection.

Other Fellows whose loss we have to deplore are :—Kenneth F. Armstrong, elected in 1930, who was killed in an accident whilst mountaineering; the Rev. E. B. Ashby, elected in 1911; William George Bainbridge, a student of the Trichoptera and Ephemeroptera, elected in 1933; W. G. Clutten, elected in 1922; G. H. Gurney, elected in 1906; G. B. Kershaw, elected in 1904; W. Ormiston, elected in 1913, who died at Colombo; and J. D. Ward, elected in 1919.

Among those, not Fellows of our Society, who have passed away during the year, mention should be made of Anton Handlirsch of Vienna, who had a great international reputation for his profound knowledge of fossil insects.

In accordance with our custom on this occasion, I will ask you to rise for a few moments as token of respect to the memories of the colleagues that we have lost during the year.

For to-night's address I have ventured to put on record some random notes on

The Relations between Mankind and the Insect World.

Before briefly reviewing the evolution of man's study of the insects and their reactions on him and on his life on this planet, we might perhaps ask ourselves what exactly is the nature of our interest in the subject, and more particularly what is our objective in studying it. To the savage, insects are merely of interest as an occasional source of food and sometimes as a source of annoyance and irritation, though in the latter respect far less than is the case among more civilised peoples. As man became more educated, insects gradually became objects of interest in themselves on account of their often brilliant and striking coloration, their extraordinary resemblances to other objects, their remarkable diversity of form, their apparently mysterious habits and metamorphoses, and their power of appearing suddenly, and as it would seem spontaneously, in vast numbers. Anything approaching an exact knowledge of them or their habits has, however, developed very slowly during the historical period. Even at the present day the less civilised tribes of Central Africa are completely unaware of the metamorphoses of insects, and are

frankly incredulous when told that the many species of caterpillars that they cook and eat as a relish with their maize porridge are in fact the immature stages of more or less familiar moths. Nor is the idea that spontaneous generation can occur among insects by any means extinct among the less educated members of even the most civilised communities. It is still, for instance, often asserted that swarms of Aphids have appeared *de novo* as the result of some particular climatic conditions, or that grain weevils or some similar pest have come into being spontaneously in a ship's cargo.

Though insects and their habits, especially those of colonial species, have attracted the attention of thoughtful and observant individuals among the more civilised communities since at least the days of the Ancient Greeks, it was a very long time before serious attempts were made to construct a classification of them. An early example is that by John Ray, F.R.S., in a very rare pamphlet contained in our library to which the Registrar has drawn my attention. It is dated 1705 and is entitled *Methodus Insectorum seu Insecta in methodum aliqualem digesta.* Under the term "insecta," are included, not only the Arthropods in general, but also many of the Vermes, and the main distinctions between them are based on their habits, whether terrestrial or aquatic. It was not, however, until the time of Linnaeus that, in common with other branches of the Animal Kingdom, attempts to put the taxonomy of insects on a serious scientific basis met with some degree of general acceptation. Since that date, thanks to the combined efforts of the field naturalist and of the systematist, bewildering numbers of species have come to be described in the literature. How great are the numbers involved can be guessed at when we recall that in species the class Insecta probably outnumbers the whole of the rest of the animal kingdom and that the generic names used for them already exceed 100,000. Even now we have done little more than touch the fringe of the subject, particularly of the more obscure and inconspicuous groups.

It is not necessary to recapitulate at length the reasons why insects have been relatively so successful in the struggle for existence compared with other classes of animals. It is clear, however, that they have derived enormous advantages from their remarkable powers of reproduction and of adaptation to their environment, as well as from their external skeleton, which, though it puts a limit to their size (probably an advantage in itself), is exceedingly efficient in other respects. As compared with man himself, they have the further advantage of immensely greater antiquity, dating as they do from at least the late Palaeozoic, and having therefore been present on this planet at least a hundred times as long. This, at least, is incontrovertible evidence of their capacity to survive under all the changes of an immense period of time, and it remains to be seen whether so recent an animal as man will be equally successful.

Before dealing with the vital necessity for increasing our knowledge of insects from the systematic standpoint, it should be pointed out that there is one aspect in which Entomology differs from other branches of Zoology, and that is its profound economic importance. Though many animals, especially the vertebrates, are of great value to man in that they provide him with food, clothing and transport, there is no class of them that comes into direct competition with him to any important degree with the exception of the insects and some other Arthropods. Many accounts have been given in recent years of the way in which insects injure the health

of man, and therefore reduce his efficiency, sterilise much of his labour in agricultural and forestry enterprises, or damage the resulting products when stored or manufactured, and I do not propose to go into them in detail here. Nevertheless, I may perhaps repeat a view that I expressed in a memorandum prepared for the Third Imperial Entomological Conference which was held in 1930. If we take the population of this planet at 2,000 million persons and that 10% (a modest estimate) of their efforts are brought to nought by the combined results of the varied ways in which insects are injurious to man, it would appear that, but for their presence, the world could support no less than 200 million more individuals with the expenditure of the same effort as is exerted at the present time. These are large figures, and it is a remarkable fact that it is only the other day, so to speak, in the history of civilisation that there has been any general recognition of the position.

It is true that there is another side to the picture. The silkworm has so long been domesticated by man that, like some of the oldest cultivated plants, it probably no longer exists in the wild state. The honey bee has also been more or less domesticated for much the same period. The products of these insects, added to the efforts of those that produce substances such as lac and cochineal, are, however, a very small compensation for the injuries inflicted upon us by the hordes of insect pests of one kind or another.

In the early days of civilisation plagues of insects were looked upon as evidences of divine wrath, and no attempts were made to stem them other than by offering prayers for relief from them. In the Middle Ages the strange custom obtained of bringing lawsuits against injurious insects. Some curious examples of this have been given by one of our Honorary Fellows, Dr. L. O. Howard,* and I cannot do better than quote his words : " Legal procedures against all sorts of noxious animals were frequent, and the famous Burgundian legal light, Bartholomaeus Chassanaeus, wrote a book setting forth the rules according to which a suit against grasshoppers should be entered. After a court had been called together by written request, a judge was appointed and two lawyers were elected, one to plead the cause of the people and one the cause of the accused grasshoppers. The former commenced by formulating the charge, and concluded by demanding that the grasshoppers be burned. The defendant's lawyer replied that such a request was illegal before the grasshoppers had been requested in due form to leave the country. When, however, they had not left the country after a stated term, they could be excommunicated." He goes on to describe how later on another jurist, Hiob Ludolph, published a work, calling attention to the lamentable legal ignorance displayed by Chassanaeus. In *his* view the accused grasshoppers must be summoned four times before the court. Failing their appearance, they must be brought before it by force. Other interested parties, such as the birds that fed on the grasshoppers, would also have the right to be heard. Howard (*loc. cit.*) also quotes a specific case at Berne in 1479 when an action was brought against worms, apparently cutworms. The worms, despite an able defence, lost their case and were excommunicated and banished. It is perhaps not surprising that in the words of the contemporary chronicler " No effect whatever resulted, evidently on account of the great depravity of the people."

The importance of the question had, however, begun to receive recognition in

* 1895, *Insect Life*, **7** : 57.

the late eighteenth and early nineteenth centuries among the relatively few individuals in the community who were interested in the subject, and it may not be out of place here to put on record details of some of the comparatively few important works on Economic Entomology that were published between the latter half of the eighteenth and the middle of the nineteenth centuries. Practically all of these are represented either in our own library or in that of the Imperial Institute of Entomology, and I am indebted to the librarians of these two institutions for assistance in compiling it.

Frisch, J. L., 1720–1738, Beschreibung von allerley Insekten in Teutschland. 13 pts., *illust. col.* Berlin.
Réaumur, R. A. F. de, 1734–1742, Mémoires pour servir à l'histoire des Insectes. 7 vols., *illust.* Paris.
Bonnet, C., 1745, Traité d'insectologie; ou observations sur les pucerons. 2 pts., *illust.* Paris.
Duhameau du Monceau, H. L., and Tillet, M., 1762, Histoire d'un insecte qui devore les grain de l'Angoumois, &c., *illust.* Paris.
Lyonnet, P., 1762, Traité anatomique de la chenille qui ronge le bois de Saule, &c., *illust.* La Haye.
Gmelin, J. F., 1787, Abhandlung über die Wurmtrokniss, *illust.* Leipzig.
Kob, J. A., 1790, Die Wahre Ursache der Baumtrokniss der Nadelwälder durch die Naturgeschichte der Forlphaläne (*Phalaena Noct. Piniperda*), &c., *illust.* Frankfurt a.M.
Linker, J. J. Freyherr von, 1798, Der besorgte Forstmann. Eine Zeitschrift über Verderbniss der Wälder durch Thiere, &c. Bd. 1, *illust.* Weimar.
Kirby, W., and Spence, W., 1815–26, An introduction to Entomology, 4 vols., *illust.* London.
Bechstein, J. M., 1818, Forstinsectologie . . . oder Naturgeschichte der für den Wald schädlichen und nützlichen Insecten, 2 Thle., *illust.* Gotha.
Major, J., 1829, A treatise on the insects most prevalent on fruit trees, &c. London.
Thiersch, E., 1830, Die Forstkäfer oder vollständige Naturgeschichte der . . . schädlichen Insekten, *illust.* Stuttgart.
Bouché, P. F., 1833, Naturgeschichte der schädlichen und nützlichen Garten-Insekten und die bewährtesten Mittel zur Vertilgung der Ersteren. Berlin.
Kollar, V., 1837, Naturgeschichte der schädlichen Insecten, &c., *Verh. k. k. Landw. Ges. Wien* (n.f.) **5** : 1–424. Wien.
Ratzeburg, J. T. C., 1837–44, Die Forst-Insecten, &c., 3 Thle., *illust.* Berlin.
de la Rue, A., 1838, Entomologie forestière, &c., *illust.* Paris.
Harris, T. W., 1841, A treatise on some of the insects of New England, which are injurious to vegetation. Cambridge, Mass.
Sidney, E., [1846], Blights of the wheat and their remedies. London.

We may also congratulate ourselves that the members of our Society were amongst these pioneers. In 1834, the year after its foundation, the Council offered a prize for an essay on the Turnip Fly, and between that date and 1870, a series of such prizes was offered. This enterprise was so far in advance of its time that it did not meet with a great deal of response, but it is at least evidence that, from its inception, our Society has recognised the importance of this aspect of the subject.

Not only have insects been a steady handicap to the attempts of mankind to compete with external conditions, but they have had, especially those of medical importance, a marked influence on the course of history, particularly since the European races began to explore and occupy the tropical regions of the world. Many historians believe that the introduction of malaria into Ancient Greece was one

of the main factors that brought that great civilisation to an end. In the sixteenth century the several expeditions made by the Portuguese to extend their dominion in Central Africa are thought to have failed mainly owing to the presence of the tsetse fly. It is said, too, that but for outbreaks of yellow fever, a mosquito-borne disease as you all know, the island of Porto Rico would now be British, that of Hayti French, and the story of the making of the Panama Canal would have been very different.

A long time was, however, to elapse before there was any general recognition of the importance of the question by the public at large or among the Ministers and permanent officials of Governments. It was not until the last half of the nineteenth century that any economic entomologists were officially employed, and then only in exceedingly small numbers.

To the United States of America must be given the credit for being the first country where the importance of economic entomology was first recognised officially. Dr. Thaddeus Harris seems to have been the first entomologist to receive payment for his services when he completed the publication of his famous report on " Insects Injurious to Vegetation " in 1841, though his first paper * to be issued on the subject dates from 1823.

The first official Government Entomologist also appears to have been appointed in that country when Townend Glover was given a post in 1853 in the Bureau of Agriculture of the U.S. Patent Office, one of his duties being " to collect information on Insects." In the following year Dr. Asa Fitch was appointed by the New York State Legislature to examine insects, especially those injurious to vegetation. The Governments of the British Empire were slower to enlist the services of entomologists, and the first to be appointed seems to have been Dr. James Fletcher, who was made entomologist to the Department of Agriculture in Canada in 1884, at first in an honorary capacity. There had, however, already been some public recognition of the value of entomology by the Government of that Dominion, the Province of Ontario having begun to make a small grant to the Entomological Society of Ontario as early as 1870–71. In Australia Government Entomologists began to be appointed towards the end of the century, Charles French in 1889 in Victoria, A. S. Oliff in 1890 in New South Wales, H. Tryon in 1895 in Queensland, and A. M. Lea in 1896 in West Australia. In New Zealand, Prof. J. W. Kirk was appointed Biologist to the State Department of Agriculture about 1890. South Africa was not far behind, and its first Government Entomologist, C. P. Lounsbury, was appointed in 1895.

In this country, probably owing to the fact that our long standing agricultural conditions have produced a new equilibrium, our entomological problems are far less serious and obvious than in more recently developed parts of the world. During the middle of the last century there was little published of importance relating to economic entomology, with the exception of the famous work on " Farm Insects " which appeared in 1860 by John Curtis, who was President of our Society in 1855. Not very long afterwards, there began to appear, at her own expense, the well known " Reports on Injurious Insects " by another of our distinguished Fellows, Miss Eleanor Ormerod, who was Honorary Consulting Entomologist to the Royal Agricultural Society from 1882–92, and her " Manual of Injurious Insects " also appeared in the latter year. So far no Government Entomologist had been appointed,

* Upon the Natural History of the Salt Marsh Caterpillar.

though an abortive attempt was made as early as 1877 to press for one at a meeting held at the Society of Arts at which the Chairman was the Duke of Buccleuch. No account appears to have been published of the position during the next thirty years, and at the risk of boring you with further details, I venture to put on record the following information which has been kindly communicated to me by Mr. J. C. F. Fryer, Director of the Ministry of Agriculture and Fisheries' Plant Pathological Laboratory. In 1885, C. Whitehead began to present reports to the Agricultural Department of the Privy Council Office that dealt largely with agricultural pests, and in 1888 he became Agricultural Advisor to the "Lords Committee of the Council for Agriculture," to whom he presented a series of Annual Reports on "Insects and Fungi Injurious to the crops of the Farm, the Orchard and the Garden." He occupied a similar position in respect of the Board of Agriculture which was apparently created about 1889, and a year later he is described as Technical Adviser to the Intelligence Department of the Board. It appears to be uncertain for how long this arrangement continued, though reports by Whitehead up to 1892 are in existence. At the beginning of this century the Board was still without its own entomologist and was advised on entomological matters by F. V. Theobald, then at the British Museum, and on his departure to Wye, about 1905, by Dr. R. Stewart MacDougall. It is, therefore, not a little remarkable that it was not until 1912 that the Ministry of Agriculture (or Board as it then was) appointed its own entomologist in the person of Mr. J. C. F. Fryer.

From that time, a more general recognition of the need for employment of entomological advisers has spread throughout the civilised world, and at the present day there are between three and four hundred trained entomologists in the British Empire alone, not to speak of large subordinate staffs.

This rapid change seems to have been due to a variety of causes. There is little doubt that entomology, in common with all the Sciences in their applied aspects, received a great stimulus as a result of the Great War. Furthermore, the demand for higher standards of agriculture and for crops of better quality has brought about a steadily growing need for advice against noxious insects. Government Departments, too, have found it essential to have on their staffs those who can advise as to the many quarantines against pests and other legislative measures that are the inevitable result of a vastly increased international trade.

The demand for entomologists thus created, at first produced considerable difficulties in this country, since neither the staff nor adequate machinery for training them then existed. Though matters have improved in recent years, it is to be deplored that at many of our Universities only limited facilities still exist for the training of entomologists, and insects are not as much utilised in the zoological schools as material for study as their remarkable and varied characters would appear to justify.

The recent meteoric advance in the attention given to insects, more particularly on the economic side, has, however, somewhat thrown out of gear the relations between it and the other branches of the science, more particularly the taxonomic one. While Government funds have been provided to an increasing, though still inadequate, extent to finance the economic entomologist, the fact that this has thrown an immense burden on those concerned in dealing with the systematics and identification of insects hardly seems to have been sufficiently recognised. At the

present time the ever-growing demands, arising from the innumerable investigations on insect pests and their insect parasites that are in progress all over the world, are quite impossible of satisfaction with the existing staffs. It is therefore incumbent upon Governments to spend more money in this direction if they are to derive the full benefit from the funds they already contribute to the solution of economic problems in Entomology. It must be remembered also that, though the amateur entomologist has done, and is still doing, excellent work in this direction, it is unlikely that in the days to come there will be so many men of the necessary leisure available as has been the case in the past.

It would seem obvious that an exact knowledge of the classification and identity of insects must of its very nature be the basis of our science, and that without it we should be unable to exchange with each other any knowledge of it that we may have. Nevertheless, incredible though it may seem, those who would decry its importance are by no means as rare as might be expected. Even in the present year, Dr. W. T. Calman, C.B., F.R.S., the distinguished President of the Linnean Society, with which we have had so many close relations in the past, has, in his latest Presidential Address,* found it necessary to comment with extreme severity on the remarks of an anonymous reviewer in *Nature* published at the beginning of the present year, who is apparently of the opinion that taxonomy " leads nowhere." Surely, in fact, it leads everywhere along the many avenues with their diverse ramifications that so many biologists are striving to explore. How other than by the work of the systematist in conjunction with that of the morphologist, embryologist and biologist can we advance our conceptions of the evolution of insects? All these equally important branches of our science are entirely dependent for the interchange of information on the accurate identification and classification of the innumerable species with which we have to deal. Moreover, the benefits derived between one branch of the subject and the other are mutual, and taxonomy itself has been enormously stimulated by discoveries during the last thirty years of the economic importance of many families of insects. Without making any exact calculation, it is quite safe to say that our knowledge of the CULICIDAE has advanced at least twenty-fold during the last thirty years since the relation between these insects and diseases such as malaria, yellow fever, filariasis, etc., became realised. To take a more concrete example, the number of species or varieties of the sandfly genus, *Phlebotomus*, mentioned in the first three volumes (1913–15) of the *Review of Applied Entomology*, Series B., which was 19, has grown in the last three completed ones (1932–34) to no less than 85. In Kieffer's volume on the Ceratopogonid midges, published in 1906, no species of *Culicoides* are recorded from the Ethiopian region. Since that date the names of at least sixty have appeared in the volumes of the *Zoological Record*.

Many other examples might be added of the influence that the recent expansion of Economic Entomology has had on our information respecting many families of insects and rendered imperative a more accurate knowledge of the species concerned and their inter-relations with each other. These demands on the systematist by the student of the applied side of the subject will undoubtedly become greater every year. One of the most outstanding features of the Fourth Imperial Entomological Conference, held in this room in September last, was the unanimously expressed

* 1935, *Proc. linn. Soc. Lond.*, **147**: 145.

demand by that very representative gathering of practical men for the utmost possible extension of the systematic work that is at present being done. Special attention was drawn in this connection to our still lamentable ignorance of such economically important groups as the parasitic Hymenoptera and Diptera and the termites. It is obviously essential for the present gaps in our knowledge to be filled, if we are to make proper use of the two former groups in solving problems where the principle of biological control can be utilised. Nor can we hope to undertake a campaign against the last-named insects that has any prospects of success, until we know a great deal more about them.

I do not think that I can do better in this connection than quote the following from the introduction to Curtis' " Farm Insects," to which work allusion has already been made :—" In perusing this volume, the reader who wishes to make himself acquainted with the economy both of his insect friends and enemies, whose histories are the subject of the following chapters, ought not to pass over as useless the descriptions of the various species. It is a great mistake to suppose, that scientific descriptions and correct nomenclature ought to be employed for the use of those only who are specially engaged in the study of natural history. If insects be not thus accurately and scientifically described, and their names carefully learned, the facts noticed by practical observers are generally worthless, and may tend to mislead, by the confusion of one species with another, and the consequent adoption of improper remedies. It is thus that I have found, in my extensive reading on these subjects, that a very large amount of the information given by practical agriculturalists and gardeners, has proved valueless in cases where, if the particular species alluded to could only have been identified, it would have been of great value in furthering subsequent investigations."

No doubt there are still many directions in which our systematists need to put their house in order. So far as our Society is concerned, I think that we can justifiably claim to have done our best within the limitations of our means. In the last few years we have not only brought into being a new journal devoted to systematic entomology, but have begun the publication of that important work *The Generic Names of British Insects*, to which allusion was made in my Address last year.

I do not propose here to touch at length on the extremely thorny and complicated questions of nomenclature. Suffice it to say that nowadays many non-entomologists find it necessary to use the names of the commoner insects, especially those that are important in an economic sense. The number of medical men interested in the subject of insect-borne diseases, of engineers dealing with anti-malarial drainage problems, of chemists studying insecticides and of bacteriologists engaged on researches into insect-borne virus diseases of plants is a considerable one. To the workers in such closely associated fields, changes in the name of a common insect, such, for example, as the yellow fever mosquito, not only cause dire confusion, but give them the impression that entomologists have a very uncertain knowledge of their own subject. It is greatly to be hoped that the principle of the adoption of *nomina conservanda* will be widely extended in such cases in the near future. Indeed, in my view, it is essential that something of this sort should be done without delay if we are to retain the confidence of the numerous workers in the many subjects that now touch the fringes of modern Economic Entomology.

To the layman the complications of nomenclature are such that the subject tends to become an object of derision, and I cannot refrain from again quoting a translation from a German source that I communicated at one of our meetings some fifteen years ago :—" Once upon a time there was a land called Nomenclatoria. The inhabitants of this land were interested in many animals, and to distinguish them from one another they gave every animal not only one but even two names. If in those days a collector caught a hawk moth, he could be almost certain that it belonged to the genus *Sphinx*. But soon the imperfections of this system became apparent. To the scientists of Nomenclatoria the genera appeared too large, so they were divided, and the divided ones subdivided, and continually changed, until after the lapse of several decades every second species had its own genus.

" Then the specific names had to be changed and new ones erected, so as to describe all the newly discovered aberrations and variations. One scientist had the ingenious idea of transposing the syllables, *e.g.* for variations of *podalirius* he used the names *lidaporius* and *daporilius*. And all, who read this, marvelled at his brain.

" Soon this was also inadequate, and every animal received three names, and after another twenty years every species had six names in which the specific name of the original form was repeated five times. Ignorant people in Nomenclatoria grinned vacantly at this and made stupid remarks about the waste of time and space.

" An old King of a neighbouring country, who had collected butterflies in his youth and prided himself on his knowledge, came on a visit. When viewing the State collections, he stopped in front of a lime hawk moth and said proudly to his guide : ' Aha, that is a *Sphinx tiliae*.' The guide was startled to death, but quickly pulled himself together and answered : ' It is entirely possible, Your Majesty, that this specimen was so called a hundred years ago. In the course of time the generic name after undergoing a more and more glorious perfection, and passing through *Smerinthus*, *Dilina*, *Mimas* and about ten other alterations, has to-day developed into *Caudex*. But this species that Your Majesty deigned to point out, is not the original form of *Caudex tiliae*, but, owing to the band on the fore-wing, as Your Majesty notices, being 1/10 mm. narrower than that of the normal form as recognised by the State, is *Caudex tiliolus tilioides tiliabundus bundilatius lidabuntius*.'

" When the guide had spoken thus, the strange King demanded forthwith two national liqueurs. He then returned to his own country and forthwith issued a decree that no animal should be allowed to have more than two names. In consequence his kingdom was considered by the scientists of Nomenclatoria to be deplorably behind the times. During the last few years, however, there has been an astonishingly large number of cases of *dementia praecox* reported from Nomenclatoria. Whether this has anything to do with the development of the names has not been determined."

So vast is the class Insecta that it is inevitable that work on its systematics must become greatly specialised. We should, however, perhaps remember that one modern definition of a specialist is " one who knows more and more about less and less." Let us beware in Entomology lest our critics come to extend it to " one who knows everything about nothing " ! Let us remember, too, that careless work or conclusions based on inadequate material only increase the labours of others and more often than not cancel out the steps forward taken by more conscientious workers.

Though the systematist who confines himself to descriptions of species performs a useful, and indeed necessary, function, his work is of little value unless his contemporaries are carrying on the more difficult task of framing generic distinctions and the broader outlines of classification. The capacity for clearly distinguishing between generic and specific characters is, however, less common than could be wished. Those who split up recognised genera into innumerable others on what are not more than specific characters merely complicate the issue for others. Without the work of those who are capable of making diagnoses of the broader outlines of classification, the building of entomological knowledge that is being constructed will consist of vast numbers of loose bricks, with inadequate supplies of mortar and with a disconnected or non-existent framework. Nor must we forget the vital need for the guides to such a building, the bibliographer and librarian, whose function it is to tell us where the varied parts of this great structure are situated and where the individual bricks have been placed.

Let me conclude this brief and necessarily somewhat superficial review by returning to our starting-point and trying to define our objects in studying this branch of Natural Science. There seem to me to be two main ones, and, if I put one before the other, it is not because they do not appear to be equally important and fruitful. Those to whom the practical side makes most appeal are clearly benefiting mankind in acquiring knowledge that assists in combating the creatures that are disputing with us for the dominion of this planet. To the student of pure science and to the philosopher nothing but benefit can be derived from a knowledge of the evolution of successful adaptations in a race of creatures entirely dissimilar from himself. Even the political student may perhaps acquire some benefit from a close study of colonial insects, amongst which the individual has no importance. He may thus learn to realise the impracticability of grafting a communistic system upon man who has evolved from the beginning on individualistic lines.

In bringing this Address to a close, I must express my thanks to you for listening patiently to what I fear has been a somewhat rambling discourse. I may also take this opportunity, on the termination of my period of office, of thanking the Officers and my numerous friends on the Council for their many kindnesses and of expressing the hope that my distinguished successor will derive as much pleasure from the occupation of this Chair as I have done.

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ERRATA.

p. 15, No. 23, for *O. violata* read *O. venata*.
p. 16, No. 43, for *D. antiopa* read *D. antiqua*.
p. 37, 3 lines from bottom, for *hydromyza* read *hydromyzina*.

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